FAIRFIELD PUBLIC SCHOOLS

Algebra 1
Honors

Grade(s):	☐ K ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 6 ☑ 7 ☑ 8	☑ 9 ☑ 10 ☐ 11 ☐ 12 ☐ Other __________
Discipline/Course:	**Discipline:** Mathematics **Course:** Algebra 1 Honors		
Course Title:	Algebra 1 Honors		
Prerequisite(s):	Successful completion of Pre-Algebra 8 (A- or higher) or Teacher Recommendation		
Course Description: *Program of Studies*	Algebra I is the foundational course for all of high school mathematics. Utilizing skills from middle grades mathematics, students will deepen and extend their understanding of numerical and algebraic relationships and make sense of a variety of functions. Topics include: equations, inequalities, functions, linear functions, systems of equations and inequalities, exponents and polynomials, factoring polynomials, quadratic functions and equations, and data analysis. There should be emphasis on problem solving and mathematical reasoning, incorporating real-world applications and effective use of technology, and using multiple representations. This course is for students with a strong mathematical background in pre-algebraic skills, which will be built upon and extended beyond the traditional Algebra I course. The depth of topics, as well as the pacing, is intended for students who exhibit strong standards of mathematical practice and habits of learning. 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?
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. ● 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.	
Duration: **Credit:**	☐ Semester ☑ Full-Year	☐ 0.5 Credit (s) ☑ 1.0 Credit(s) ☐ 1.5 Credit(s) ☐ N/A
Course Materials/Resources:	enVision Algebra 1, Savvas Learning Company College Board Pre-AP Algebra I, Geometry, Algebra II Open Up Resources - Math	
FPS Course Academic Expectation(s):	☑ Exploring and Understanding (EU) ☐ Synthesizing and Evaluating (SE) ☐ Creating and Constructing (CC) ☑ Conveying Ideas (CI) ☐ Collaborating Strategically (CS) ☐ Using Communication Tools (UCT)	
Unit Overview	**Unit 1:** Solving Equations and Inequalities (~6 weeks) **Unit 2:** Functions and Relations (~6 weeks) **Unit 3**: Systems of Equations and Inequalities (~5 weeks) **Unit 4:** Exponents and Polynomial Expressions (~8 weeks) **Unit 5:** Quadratic Functions and Equations (~8 weeks) **Unit 6:** Data and Statistics (~5 weeks)	

Unit Number and Title:	**Unit 1 -** Solving Equations and Inequalities
Duration:	~6 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.
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.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 following 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):	• What logical arguments and properties of equality justify each step taken when solving an equation, and how does this guarantee a viable solution?

	- 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 or inequalities, how does the definition of absolute value lead to solutions that are either two-part, one-part, or none? - How do the consistent use of units and an appropriate level of accuracy guide the solution of multi-step problems and inform the interpretation of results?
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 ● Modeling in contexts ○ constraints within a real-world scenario **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. ● 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 (including compound and absolute-value solutions) 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.

Unit Number and Title:	**Unit 2** - Functions and Relations
Duration:	~ 6 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 emphasizes 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. The study extends to absolute value functions and to real-world and mathematical contexts involving a constant rate of change. 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):	**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
	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 a function that models a relationship between two quantities	
	F-BF.1	Write a function that models a relationship between two quantities.
		a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
	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	

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<tr><td>S-ID.6</td><td>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</td></tr>
<tr><td></td><td>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.</td></tr>
<tr><td></td><td>c. Fit a linear function for a scatter plot that suggests a linear association</td></tr>
<tr><td colspan="2">Interpret linear models</td></tr>
<tr><td>S-ID.7</td><td>Interpret the slope (rate of change) and intercept (constant term) of a linear model in the context of data.</td></tr>
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<td>Essential Question(s):</td>
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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 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?
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?
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?
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?

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When a linear equation is written in slope-intercept form, $y=mx+b$, m is the slope, and the line

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Understanding:	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. ● There are many ways to algebraically represent a linear function, and each form reveals different aspects of the function. ● A function assigns exactly one output to each input, and can be represented in multiple ways to reveal its behavior and 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.

Learning Goal(s):
Students will know and will be able to use their learning to:
(Content/ Skills)
	Content: (Students will know…)
	
	● 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 - 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 descriptions - Scatterplots - positive/negative association - linear/nonlinear association - trend line **Skills:** (Students will be able to…) - graph linear equations on coordinate axes with correctly labeled scales and intercepts. - 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). - analyze a linear model to interpret the meaning of the slope and the y-intercept within the context of the data.

	● 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. ● 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. ● graph an absolute value function and identify key features of 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.

Unit Number and Title:	**Unit 3** - Systems of Equations and Inequalities
Duration:	~ 5 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	In middle grades, students solved linear systems in two variables. In unit 3, 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. The unit emphasizes two goals: determining the solution to a system and developing strategic decision-making in method selection. Students apply systems of linear equations and inequalities to model real-world situations with multiple constraints, including problems where an optimal solution is desired. Through these applications, students deepen their understanding of what solutions represent in context and build on prior knowledge to solve increasingly complex problems.
Learning Goals	
Standard(s):	

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. **Create equations that describe numbers or relationships** **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.
Essential Question(s):	• 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):	• The intersection of the graphs of a pair of linear equations is used to estimate the solution to the system.

	• If two lines intersect at a point, there is exactly one solution. If the two lines are the same, there are infinitely many solutions; if the two lines are parallel, there is no solution. • Substitution is one method for solving systems of equations. • Elimination is an alternate method for solving systems of equations when it is not easy to use substitution. • The graph of a linear inequality in two variables shows the solutions of the inequality in the half plane. • Systems of linear inequalities can be solved by graphing. The solution is the intersection of the corresponding half-planes.

Learning Goal(s):
Students will know and will be able to use their learning to:
(Content/ Skills)
	Content: (Students will know:)
	
	• 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
	  ○ boundaries
	  ○ 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…)

	• 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 4** - Exponents and Polynomial Expressions
Duration:	~ 8 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	
	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.

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Unit Number and Title:	**Unit 5** - 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).

	Building Functions **F-BF.1** — Write a function that models a relationship between two quantities. **Building 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.
Essential Question(s):	• 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?
Enduring Understanding(s):	• 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.

	● 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 ○ zeros, 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 ● Linear/quadratic system of equations **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. • analyze and compare a system of quadratic and linear functions using a graph or a table.

Unit Number and Title:	**Unit 6-** Algebraic Statistics
Duration:	~5 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	In this unit on algebraic statistics, students will use their previous experience with data to develop a formal means of modeling real-world situations. Students will examine 1-variable statistics, extending their prior knowledge of dot plots, box plots, and histograms. They will examine measures of center and spread to compare data sets. Students will use standard deviation to quantify and analyze the spread of data. Throughout the unit, students will analyze the data, interpret, and make inferences.
Learning Goals	

Standard(s):

Summarize, represent, and interpret data on a single count or measurement variable	
S-ID.1	Represent data with a plot on the real number line (dot plots, histograms, and box plots)
S-ID.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
S-ID.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Essential Question(s):	• How can data be represented and analyzed to make sense of real-world situations? • How do different data displays (dot plots, histograms, and box plots) influence how we interpret a data set? • How do measures of center and spread help us compare data sets and understand variability?

Enduring Understanding(s):	● Data can be organized, displayed, and modeled to reveal patterns and support predictions about real-world situations. ● Dot plots, histograms, and box plots each highlight different features of data, such as clusters, outliers, and distribution shape. ● Measures of center (mean, median) and spread (IQR, standard deviation) describe and compare distributions. ● The shape of a distribution affects which measures of center and variability are most appropriate.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Measures of central tendency ○ mean, median, mode ○ variation ○ outlier ○ cluster ○ spread ○ interquartile range ○ mean absolute deviation ● Standard deviation ○ normal distribution ● Shape of data display ○ skewed left, skewed right ○ symmetric ● Types of data displays for one-variable statistics ○ dot plot ○ box plot ○ histogram **Skills:** (Students will be able to…)

	● analyze and interpret numerical data distributions represented with frequency tables, histograms, dot plots, and box plots. ● calculate, compare, and interpret mean, median, and range. ● compare distributions using measures of center and spread, including: a. distributions with different means and the same standard deviations. b. distributions with different standard deviations. ● understand and describe the effect of outliers on the mean and median