Georgia's K-12 Mathematics Standards Curriculum Map

Implementation beginning Fall 2023

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS (GRADE 8)

(A thoughtful blend of Grade 8 Mathematics & HS Algebra: Concepts and Connections for High School Credit in 8th Grade)

- **This course is for Middle School Students Interested in Pursuing Accelerated Mathematics and Earning High School Mathematics Credit.
- **This course awards 1 High School Carnegie Unit for Algebra: Concepts & Connections.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS CURRICULUM MAP

Georgia's K-12 Mathematics Standards
ENHANCED ALGEBRA:CONCEPTS AND CONNECTIONS

SEMESTER 1				SEMESTER 2			
Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**
Modeling Linear Relationships & Functions Interdisciplinary Connections	Analyzing Systems of Linear Equations and Inequalities Interdisciplinary Connections	Investigating Rational and Irrational Numbers Interdisciplinary Connections	Modeling and Analyzing Quadratic Functions Interdisciplinary Connections	Modeling and Analyzing Exponential Expressions, Equations, and Functions Interdisciplinary Connections	Investigating Data and Statistical Reasoning Interdisciplinary Connections	Algebraic Connections to Geometric Concepts Interdisciplinary Connections	Culminating Capstone Unit
5 – 6 weeks	**3 – 4 weeks**	**2 – 3 weeks**	**5 – 6 weeks**	**5 – 6 weeks**	**3 – 4 weeks**	**3 – 4 weeks**	**1 – 2 weeks**
8.PAR.3 8.PAR.4 8.FGR.5 A.FGR.2 A.MM.1 A.MP.1-8	8.FGR.7 A.PAR.4 A.MM.1 A.MP.1-8	8.NR.1 8.NR.2 A.NR.5 A.MM.1 A.MP.1-8	A.PAR.6 A.FGR.7 A.MM.1 A.MP.1-8	A.PAR.8 A.FGR.9 A.MM.1 A.MP.1-8	8.FGR.6 A.DSR.10 A.MM.1 A.MP.1-8	8.GSR.8 A.GSR.3 A.MM.1 A.MP.1-8	ALL STANDARDS A.MP.1-8

Ongoing interdisciplinary learning to impact the community and to explain real-life phenomena

The concepts in each unit are presented based on a logical, mathematical progression. Each unique unit in sequence builds upon the previous unit.

The Framework for Statistical Reasoning, Mathematical Modeling Framework, and the K-12 Mathematical Practices should be taught throughout the units.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

Key for Course Standards: MP: Mathematical Practices, MM: Mathematical Modeling, NR: Numerical Reasoning, PAR: Patterning & Algebraic Reasoning, GSR: Geometric & Spatial Reasoning, FGR: Functional & Graphical Reasoning, DSR: Data & Statistical Reasoning

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Year-At-A-Glance

Semester 1

Pacing Suggestion	Unit	Content Standards	Learning Objectives	
5 - 6 weeks	***Unit 1: Modeling Linear Relationships & Functions*** *In this unit, students will incorporate patterning and algebraic reasoning to create, interpret, solve, and graph linear equations and linear functions in different forms, depending upon the given context. Students will interpret expressions with multiple factors and/or terms and manipulate linear and literal equations expressed in various forms. Students will use formal notation to represent linear functions, use functional and graphical reasoning to informally compare linear and non-linear functions using parent graphs, and identify key characteristics of graphs of linear functions. Students will also construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena.*	8.PAR.3 8.PAR.4 8.FGR.5 A.FGR.2 A.MM.1 A.MP.1-8	8.PAR.3.1 8.PAR.3.2 8.PAR.3.3 8.PAR.3.4 8.PAR.3.5 8.PAR.3.6 8.PAR.4.1 8.PAR.4.2 8.FGR.5.1 8.FGR.5.2 8.FGR.5.3 8.FGR.5.4 8.FGR.5.5	8.FGR.5.6 8.FGR.5.7 8.FGR.5.8 8.FGR.5.9 A.MM.1.1 A.MM.1.2 A.MM.1.4 A.MM.1.5 A.FGR.2.1 A.FGR.2.2 A.FGR.2.3 A.FGR.2.4 A.FGR.2.5
3 - 4 weeks	***Unit 2: Analyzing Systems of Linear Equations and Inequalities*** *In this unit, students will extend their understanding of solving equations and functional and graphical reasoning to solving systems of equations, including those created by parallel and/or perpendicular lines. Solving systems should include estimating solutions graphically, solving using substitution, and solving using elimination. Students will also create, analyze, interpret, solve, and graph linear inequalities in one and two variables and find solutions to systems of linear inequalities to model real-life phenomena.*	8.FGR.7 A.PAR.4 A.MM.1 A.MP.1-8	8.FGR.7.1 8.FGR.7.2 8.FGR.7.3 8.FGR.7.4 8.FGR.7.5	A.PAR.4.1 A.PAR.4.2 A.PAR.4.3 A.MM.1.1 A.MM.1.4
2 - 3 weeks	***Unit 3: Investigating Rational and Irrational Numbers*** *In this unit, students extend their knowledge of numerical reasoning and real numbers to include irrational numbers, develop an understanding of the properties of exponents, and perform operations with numbers expressed in scientific notation.*	8.NR.1 8.NR.2 A.NR.5 A.MM.1 A.MP.1-8	8.NR.1.1 8.NR.1.2 8.NR.2.1 8.NR.2.2 8.NR.2.3 8.NR.2.4	A.NR.5.1 A.NR.5.2 A.MM.1.1 A.MM.1.2 A.MM.1.4 A.MM.1.5
5 - 6 weeks	***Unit 4: Modeling and Analyzing Quadratic Functions*** *In this unit, students will analyze quadratic functions. Students will (1) investigate key features of graphs; (2) solve quadratic equations by taking square roots, factoring ($x^2 + bx + c$ AND $ax^2 + bx + c$), completing the square, and using the quadratic formula; (3) compare and contrast graphs in standard, vertex, and intercept forms. Students will only work with real number solutions.*	A.PAR.6 A.FGR.7 A.MM.1 A.MP.1-8	A.PAR.6.1 A.PAR.6.2 A.PAR.6.3 A.PAR.6.4 A.FGR.7.1 A.FGR.7.2 A.FGR.7.3 A.FGR.7.4	A.MM.1.1 A.MM.1.2 A.MM.1.4 A.MM.1.5 A.FGR.7.5 A.FGR.7.6 A.FGR.7.7 A.FGR.7.8 A.FGR.7.9

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Year-At-A-Glance

Semester 2

Pacing Suggestion	Unit	Content Standards	Learning Objectives	
5 - 6 weeks	***Unit 5: Modeling and Analyzing Exponential Expressions, Equations, and Functions*** *In this unit, students will interpret exponential expressions, one variable exponential equations in context, and understand parameters of two variable exponential equations. Students will also construct and analyze the graph of an exponential function to explain a contextual situation for which the graph serves as a model; compare exponential with linear and quadratic functions.*	A.PAR.8 A.FGR.9 A.MM.1 A.MP.1-8	A.PAR.8.1 A.PAR.8.2 A.PAR.8.3 A.PAR.8.4 A.FGR.9.1 A.FGR.9.2 A.FGR.9.3	A.FGR.9.4 A.FGR.9.5 A.MM.1.1 A.MM.1.2 A.MM.1.4 A.MM.1.5
3 - 4 weeks	***Unit 6: Investigating Data and Statistical Reasoning*** *In this unit, students will extend the study of linear relationships by exploring models and tables to model relationships between quantities and describe the rate of change. Students will collect, analyze, and interpret univariate quantitative data to answer statistical investigative questions that compare groups to solve real-life problems. Students will represent bivariate data on a scatter plot and fit a function to the data to make predictions, answer statistical investigative questions, solve real-life problems based on data distributions.*	8.FGR.6 A.DSR.10 A.MM.1 A.MP.1-8	8.FGR.6.1 8.FGR.6.2 8.FRG.6.3 8.FGR.6.4 A.DSR.10.1 A.DSR.10.2 A.DSR.10.3 A.DSR.10.4	A.DSR.10.5 A.DSR.10.6 A.DSR.10.7 A.MM.1.1 A.MM.1.2 A.MM.1.3 A.MM.1.4 A.MM.1.5
3 - 4 weeks	***Unit 7: Algebraic Connections to Geometric Concepts*** *In this unit, students will extend their work with irrational numbers and apply their geometric and spatial reasoning to interpret and solve problems involving the Pythagorean Theorem. Students will work with right triangles and investigate proofs of the Pythagorean Theorem and its converse. Students will solve problems involving distance, midpoint, slope, area, and perimeter to model and explain real-life phenomena. They will also extend their knowledge of volume from previous grades to solve problems involving cones, cylinders, and spheres.*	8.GSR.8 A.GSR.3 A.MM.1 A.MP.1-8	8.GSR.8.1 8.GSR.8.2 8.GSR.8.3 8.GSR.8.4 A.GSR.3.1 A.GSR.3.2	A.MM.1.1 A.MM.1.3 A.MM.1.4 A.MM.1.5
1 - 2 weeks	***Unit 8: Culminating Capstone Unit*** ***(applying concepts in real-life contexts through a culminating interdisciplinary unit)*** *The capstone unit applies content that has already been learned in previous interdisciplinary PBLs and units throughout the school year. The capstone unit is an interdisciplinary unit that allows students to create a presentation, report, or demonstration that could include their models used to answer an overarching driving question.*	All standards A.MP.1-8	All Associated Learning Objectives	

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Semester 1

Unit 1: Modeling Linear Relationships & Functions (5 - 6 weeks)

Big Ideas: Patterning & Algebraic Reasoning, Functional & Graphical Reasoning and Mathematical Modeling

Standard Addressed in this Unit:

8.PAR.3: Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena.

Suggested Clusters of Concepts (Learning Objectives)

8.PAR.3.1 Interpret expressions and parts of an expression, in context, by utilizing formulas or expressions with multiple terms and/or factors.

8.PAR.3.2 Describe and solve linear equations in one variable with one solution (x = a), infinitely many solutions (a = a), or no solutions (a = b). Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

8.PAR.3.3 Create and solve linear equations and inequalities in one variable within a relevant, real-life application.

8.PAR.3.4 Using algebraic properties and the properties of real numbers, justify the steps of a one-solution equation or inequality.

8.PAR.3.5 Solve linear equations and inequalities in one variable with coefficients represented by letters and explain the solution based on the contextual, mathematical situation.

8.PAR.3.6 Use algebraic reasoning to fluently manipulate linear and literal equations expressed in various forms to solve relevant, mathematical problems.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

Standards Addressed in this Unit:

8.PAR.4 Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical, mathematical models and use the graphical, mathematical model to explain real-life phenomena represented in the graph.

8.FGR.5 Describe the properties of functions to define, evaluate, and compare relationships, and use functions and graphs of functions to model and explain real-life phenomena.

Suggested Clusters of Concepts (Learning Objectives)

8.PAR.4.1 Use the equation y = mx (proportional) for a line through the origin to derive the equation y = mx + b (non-proportional) for a line intersecting the vertical axis at b.

8.PAR.4.2 Show and explain that the graph of an equation representing an applicable situation in two variables is the set of all its solutions plotted in the coordinate plane.

8.FGR.5.1 Show and explain that a function is a rule that assigns to each input exactly one output.

8.FGR.5.2 Within realistic situations, identify and describe examples of functions that are linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

8.FGR.5.3 Relate the domain of a linear function to its graph and where applicable to the quantitative relationship it describes.

8.FGR.5.4 Compare properties (rate of change and initial value) of two functions used to model an authentic situation each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

8.FGR.5.5 Write and explain the equations y = mx + b (slope-intercept form), Ax + By = C (standard form), and $(y - y_1) = m(x-x_1)$ (point-slope form) as defining a linear function whose graph is a straight line to reveal and explain different properties of the function.

8.FGR.5.6 Write a linear function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

8.FGR.5.7 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph.

8.FGR.5.8 Explain the meaning of the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

8.FGR.5.9 Graph and analyze linear functions expressed in various algebraic forms and show key characteristics of the graph to describe applicable situations.

Standard Addressed in this Unit:
A.FGR.2: Construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena. Use formal notation to represent linear functions and the key characteristics of graphs of linear functions, and informally compare linear and non-linear functions using parent graphs.

Suggested Clusters of Concepts (Learning Objectives)

A.FGR.2.1 Use mathematically applicable situations algebraically and graphically to build and interpret arithmetic sequences as functions whose domain is a subset of the integers.

A.FGR.2.2 Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation.

A.FGR.2.5 Analyze the difference between linear functions and nonlinear functions by informally analyzing the graphs of various parent functions (linear, quadratic, exponential, absolute value, square root, and cube root parent curves).

A.FGR.2.3 Relate the domain and range of a linear function to its graph and, where applicable, to the quantitative relationship it describes. Use formal interval and set notation to describe the domain and range of linear functions.

A.FGR.2.4 Use function notation to build and evaluate linear functions for inputs in their domains and interpret statements that use function notation in terms of a mathematical framework. *(See the* Mathematical Modeling Framework *and the* Framework for Statistical Reasoning *for contextual connections.)*

Standard Addressed in this Unit:
A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.
NOTE: The following learning objective(s) will be addressed throughout the unit.

Suggested Clusters of Concepts (Learning Objectives)

A.MM.1.1 Explain applicable, mathematical problems using a mathematical model
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A.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities domains.

A.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 2: Analyzing Systems of Linear Equations and Inequalities (3 - 4 weeks)
Big Ideas: Patterning & Algebraic Reasoning, Functional & Graphical Reasoning and Mathematical Modeling
Standard Addressed in this Unit: ***8.FGR.7 Justify and use various strategies to solve systems of linear equations to model and explain real-life phenomena.***
Suggested Clusters of Concepts (Learning Objectives)
8.FGR.7.1 Interpret and solve relevant mathematical problems leading to two linear equations in two variables. **8.FGR.7.2** Show and explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because the points of intersection satisfy both equations simultaneously. **8.FGR.7.3** Approximate solutions of two linear equations in two variables by graphing the equations and solving simple cases by inspection. **8.FGR.7.4** Analyze and solve systems of two linear equations in two variables algebraically to find exact solutions.
8.FGR.7.5 Create and compare the equations of two lines that are either parallel to each other, perpendicular to each other, or neither parallel nor perpendicular.
Standard Addressed in this Unit: ***A.PAR.4: Create, analyze, and solve linear inequalities in two variables and systems of linear inequalities to model real-life phenomena.***
Suggested Cluster of Concepts (Learning Objectives)
A.PAR.4.1 Create and solve linear inequalities in two variables to represent relationships between quantities including mathematically applicable situations; graph inequalities on coordinate axes with labels and scales. **A.PAR.4.2** Represent constraints of linear inequalities and interpret data points as possible or not possible. **A.PAR.4.3** Solve systems of linear inequalities by graphing, including systems representing a mathematically applicable situation.
Standard Addressed in this Unit: ***A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.*** **NOTE: The following learning objective(s) will be addressed throughout the unit.**
Suggested Cluster of Concepts (Learning Objectives)
A.MM.1.1 Explain applicable, mathematical problems using a mathematical model. **A.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 3: Investigating Rational and Irrational Numbers (2 - 3 weeks)

Big Ideas: Numerical Reasoning and Mathematical Modeling

Standard Addressed in this Unit:

8.NR.1 Solve problems involving irrational numbers and rational approximations of irrational numbers to explain real-life applications.

Suggested Cluster of Concepts (Learning Objectives)

8.NR.1.1 Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.

8.NR.1.2 Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.

Standard Addressed in this Unit:

8.NR.2 Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real-life phenomena.

Suggested Clusters of Concepts (Learning Objectives)

8.NR.2.1 Apply the properties of integer exponents to generate equivalent numerical expressions.

8.NR.2.2 Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $|x| \leq 25$) has two solutions and $x^3 = p$ (where p is a negative or positive rational number and $|x| \leq 10$) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.

8.NR.2.3 Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.NR.2.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools).

Standard Addressed in this Unit: ***A.NR.5: Investigate rational and irrational numbers and rewrite expressions involving square roots and cube roots.***
Suggested Clusters of Concepts (Learning Objectives)
A.NR.5.1 Rewrite algebraic and numeric expressions involving radicals.
A.NR.5.2 Using numerical reasoning, show and explain that the sum or product of rational numbers is rational, the sum of a rational number and an irrational number is irrational, and the product of a nonzero rational number and an irrational number is irrational.
Standard Addressed in this Unit: ***A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.***   **NOTE: The following learning objective(s) will be addressed throughout the unit.**
Suggested Cluster of Concepts (Learning Objectives)
A.MM.1.1 Explain applicable, mathematical problems using a mathematical model.   **A.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 4: Modeling and Analyzing Quadratic Functions (5 - 6 weeks)
Big Ideas: Patterning & Algebraic Reasoning, Functional & Graphical Reasoning, and Mathematical Modeling
Standard Addressed in this Unit: ***A.PAR.6: Build quadratic expressions and equations to represent and model real-life phenomena; solve quadratic equations in contextual situations.***
Suggested Clusters of Concepts (Learning Objectives)
A.PAR.6.1 Interpret quadratic expressions and parts of a quadratic expression that represent a quantity in terms of its context.
A.PAR.6.2 Fluently choose and produce an equivalent form of a quadratic expression to reveal and explain properties of the quantity represented by the expression.
A.PAR.6.3 Create and solve quadratic equations in one variable and explain the solution in the context of real-life phenomena.
A.PAR.6.4 Represent constraints by quadratic equations and interpret data points as possible or not possible in a modeling context.
Standard Addressed in this Unit: ***A.FGR.7: Construct and interpret quadratic functions from data points to model and explain real-life phenomena; describe key characteristics of the graph of a quadratic function to explain a contextual situation for which the graph serves as a model.***
Suggested Clusters of Concepts (Learning Objectives)
A.FGR.7.1 Use function notation to build and evaluate quadratic functions for inputs in their domains and interpret statements that use function notation in terms of a context.
A.FGR.7.2 Identify the effect on the graph generated by a quadratic function when replacing f(x) with 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.
A.FGR.7.3 Graph and analyze the key characteristics of quadratic functions including contextual situations.

A.FGR.7.4 Relate the domain and range of a quadratic function to its graph and, where applicable, to the quantitative relationship it describes.
A.FGR.7.5 Rewrite a quadratic function representing a contextual, mathematical to reveal the maximum or minimum value of the function it defines. Explain what the value describes in context.
A.FGR.7.6 Create quadratic functions in two variables to represent relationships between quantities; graph quadratic functions on the coordinate axes with labels and scales.
A.FGR.7.7 Estimate, calculate, and interpret the average rate of change of a quadratic function and make comparisons to the average rate of change of linear functions.
A.FGR.7.8 Write a function defined by a quadratic expression in different but equivalent forms to reveal and explain different properties of the function.
A.FGR.7.9 Compare characteristics of two functions each represented in a different way.

Standard Addressed in this Unit:

A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

NOTE: The following learning objective(s) will be addressed throughout the unit.

Suggested Clusters of Concepts (Learning Objectives)
A.MM.1.1 Explain contextual, mathematical problems using a mathematical model.
A.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
A.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.
A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Semester 2

Unit 5: Modeling and Analyzing Exponential Expressions, Equations, and Functions (5 - 6 weeks)

Big Ideas: Patterning & Algebraic Reasoning, Functional & Graphical Reasoning and Mathematical Modeling

Standard Addressed in this Unit:

A.PAR.8: Create and analyze exponential expressions and equations to represent and model real-life phenomena; solve exponential equations in mathematically applicable situations.

Suggested Clusters of Concepts (Learning Objectives)

A.PAR.8.1 Interpret exponential expressions and parts of an exponential expression that represent a quantity in terms of its framework

A.PAR.8.2 Create exponential equations in one variable and use them to solve problems, including mathematically applicable situations.

A.PAR.8.3 Create exponential equations in two variables to represent relationships between quantities, including in mathematically applicable situations; graph equations on coordinate axes with labels and scales.

A.PAR.8.4 Represent constraints by exponential equations and interpret data points as possible or not possible in a modeling environment.

Standard Addressed in this Unit:

A.FGR.9: Construct and analyze the graph of an exponential function to explain a mathematically applicable situation for which the graph serves as a model; compare exponential with linear and quadratic functions.

Suggested Clusters of Concepts (Learning Objectives)

A.FGR.9.1 Use function notation to build and evaluate exponential functions for inputs in their domains and interpret statements that use function notation in terms of a context.

A.FGR.9.2 Graph and analyze the key characteristics of simple exponential functions based on mathematically applicable situations.

A.FGR.9.3 Identify the effect on the graph generated by an exponential function when replacing f(x) with f(x) + k, and k f(x), for specific values of k (both positive and negative); find the value of k given the graphs.

A.FGR.9.4 Use mathematically applicable situations algebraically and graphically to build and interpret geometric sequences as functions whose domain is a subset of the integers.

A.FGR.9.5 Compare characteristics of two functions each represented in a different way.

Standard Addressed in this Unit: ***A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.***   ***NOTE: The following learning objective(s) will be addressed throughout the unit.***
Suggested Clusters of Concepts (Learning Objectives)
A.MM.1.1 Explain applicable, mathematical problems using a mathematical model.   **A.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities domains.   **A.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.
A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 6: Investigating Data and Statistical Reasoning (3 - 4 weeks)

Big Ideas: Data & Statistical Reasoning, Functional & Graphical Reasoning, and Mathematical Modeling

Standards Addressed in this Unit:

8.FGR.6: Solve practical, linear problems involving situations using bivariate quantitative data.

A.DSR.10: Collect, analyze, and interpret univariate quantitative data to answer statistical investigative questions that compare groups to solve real-life problems; Represent bivariate data on a scatter plot and fit a function to the data to answer statistical questions and solve real-life problems.

Suggested Clusters of Concepts (Learning Objectives)

A.DSR.10.1 Use statistics appropriate to the shape of the data distribution to compare center (median and mean) and variability (interquartile range, standard deviation) of two or more distributions by hand and using technology.

A.DSR.10.2 Interpret differences in shape, center, and variability of the distributions in the framework (context), accounting for possible effects of extreme data points (outliers).

8.FGR.6.1 Show that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, visually fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line of best fit.

A.DSR.10.3 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

8.FGR.6.2 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts.

8.FGR.6.3 Explain the meaning of the predicted slope (rate of change) and the predicted intercept (constant term) of a linear model in the context of the data.

A.DSR.10.4 Interpret the slope (predicted rate of change) and the intercept (constant term) of a linear model in the framework of the data.

8.FGR.6.4 Use appropriate graphical displays from data distributions involving lines of best fit to draw informal inferences and answer the statistical investigative question posed in an unbiased statistical study.

A.DSR.10.5 Calculate the line of best fit and interpret the correlation coefficient, r, of a linear fit using technology. Use r to describe the strength of the goodness of fit of the regression. Use the linear function to make predictions and assess how reasonable the prediction is in context.

A.DSR.10.6 Decide which type of function is most appropriate by observing graphed data.

A.DSR.10.7 Distinguish between correlation and causation.

Standard Addressed in this Unit:

A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

NOTE: The following learning objective(s) will be addressed throughout the unit.

Suggested Clusters of Concepts (Learning Objectives)

A.MM.1.1 Explain contextual, mathematical problems using a mathematical model.

A.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

A.MM.1.3 Use units of measure (linear, area, capacity, rates, and time) as a way to make sense of conceptual problems; identify, use, and record appropriate units of measure within context, within data displays, and on graphs; convert units and rates using proportional reasoning given a conversion factor; use units within multi-step problems and formulas; interpret units of input and resulting units of output.

A.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 7: Algebraic Connections to Geometric Concepts (3 - 4 weeks)
Big Ideas: Geometric & Spatial Reasoning and Mathematical Modeling
Standards Addressed in this Unit: ***8.GSR.8 Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real-life phenomena.*** ***A.GSR.3: Solve problems involving distance, midpoint, slope, area, and perimeter to model and explain real-life phenomena.***
Suggested Clusters of Concepts (Learning Objectives)
8.GSR.8.1 Explain a proof of the Pythagorean Theorem and its converse using visual models. **8.GSR.8.2** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles within authentic mathematical problems in two and three dimensions. **8.GSR.8.3** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system in practical mathematical problems.
A.GSR.3.1 Solve real-life problems involving slope, parallel lines, perpendicular lines, area, and perimeter.
A.GSR.3.2 Apply the distance formula, midpoint formula, and slope of line segments to solve real-world problems.
8.GSR.8.4 Apply the formulas for the volume of cones, cylinders, and spheres and use them to solve relevant, real-life problems.
Standard Addressed in this Unit: ***A.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.*** ***NOTE: The following learning objective(s) will be addressed throughout the unit.***
Suggested Clusters of Concepts (Learning Objectives)
A.MM.1.1 Explain contextual, mathematical problems using a mathematical model.
A.MM.1.3 Use units of measure (linear, area, capacity, rates, and time) as a way to make sense of conceptual problems; identify, use, and record appropriate units of measure within context, within data displays, and on graphs; convert units and rates using proportional reasoning given a conversion factor; use units within multi-step problems and formulas; interpret units of input and resulting units of output.
A.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.
A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

ENHANCED ALGEBRA: CONCEPTS AND CONNECTIONS

Unit 8: Culminating Task (1 - 2 weeks)

(applying concepts in real-life contexts through a culminating interdisciplinary unit)

Multiple standards are addressed in this unit.

The capstone unit applies content that has already been learned in previous interdisciplinary PBLs and units throughout the school year. The capstone unit is an interdisciplinary unit that allows students to create a presentation, report, or demonstration that could include their models used to answer an overarching driving question. (e.g., Students can present their solution(s), findings, project, or answer to the driving question to a larger audience during the culminating capstone unit.)

Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.