HARFORD COUNTY PUBLIC SCHOOLS

ALGEBRA 1 GRADE 7 CURRICULUM

CLICK HERE for the Maryland College and Career Ready Standards for Grade 8.

CLICK HERE for the Maryland College and Career Ready Standards for Algebra 1.

Unit 1: Using Algebra to Explain

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

Enduring Understandings

- For a given set of numbers there are relationships that are always true, and these are the rules that govern arithmetic and algebra.
- Mathematical situations and structures can be translated and represented abstractly using variables, expressions, and equations.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- How can linear equations and inequalities be used to solve real world problems?
- How can a graph be used to represent the solution set of an inequality?

Lesson Title	Lesson Overview	Standards
Exploration Lesson & First Day Activities	Students will explore numeric and algebraic properties and simplify numeric and algebraic expressions using the area model for multiplication.	7.NS.A.1d 7.NS.A.2c
The Distributive Property and Removing Parentheses	Students will use the area model to build conceptual understanding of the Distributive Property, both with multiplying and with expanding a fraction.	7.EE.A.1 7.EE.A.2
The Distributive Property and Adding Like Terms	Students will apply operations as strategies to add, subtract, and expand linear expressions with rational coefficients.	7.EE.A.1 7.EE.A.2

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Opposites	Students will simplify algebraic expressions by applying both opposite properties. Students will perform repeated reasoning with the opposite properties and generate their own rules.	7.EE.A.1
Explaining Addition and Subtraction Related Facts & Explaining Multiplication and Division Related Facts	Students will use fact triangles to solve for variables.	7.NS.A.1 7.NS.A.2
Solving Equations by Creating Equivalent Equations & Solving $ax + b = c$	Students will justify steps while solving equations with properties.	7.EE.B.4a 8.EE.C.7b
Using the Distributive Property in Solving Equations	Students will solve equations involving real-world and mathematical problems.	7.EE.B.4a 8.EE.C.7b
Inequalities and Multiplication	Students will solve inequalities, graph the solution set on a number line, and check a value in that solution set.	7.EE.B.4b
Solving $ax + b < c$	Students will solve inequalities involving real-world and mathematical problems, graph the solution set on a number line, and check a value in that solution set.	7.EE.B.4b

Unit 2: More Linear Equations and Inequalities

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

Enduring Understandings

- For a given set of numbers there are relationships that are always true, and these are the rules that govern arithmetic and algebra.
- Mathematical situations and structures can be translated and represented abstractly using variables, expressions, and equations.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- How can linear equations and inequalities be used to solve real world problems?
- How can a graph be used to represent the solution set of an inequality?

Lesson Title	Lesson Overview	Standards
Exploration Lesson Percent & Uses of Tables, Equations, and Graphs	Students will compare the properties of two functions represented in different ways (e.g., tables, graphs, equations, and written descriptions). Students will use rates of change to compare functions (for example, determining which function has a greater rate of change).	7.RP.A.2c
Solving Percent Problems Using Equations	Students will use equations to solve percent problems.	7.RP.A.3
Using Tables and Graphs to Solve	Students will solve real-world and mathematical problems involving tables and graphs.	8.EE.C.7a 8.EE.C.7b
Solving $ax + b = cx + d$	Students will solve multi-step equations first with manipulatives, then algebraically.	8.EE.C.7b A.REI.A.1

Solving $ax + b < cx + d$	Students will solve multi-step inequalities, graph the solution set on a number line, and check a value in that solution set.	A.REI.B.3
Situations That Always or Never Happen	Students will solve equations that have one solution, no solutions, and infinitely many solutions.	8.EE.C.7a
Equivalent Formulas	Students will solve equations for one variable in terms of another.	A.CED.A.4
Solving for y	Students will rearrange a formula to highlight a quantity of interest.	A.CED.A.4
Compound Inequalities, *And* and *Or*	Students will solve compound inequalities and graph the solutions on a number line.	A.REI.B.3
Solving Absolute Value Equations	Students will solve absolute value equations of the form $\|x\| = a$ and $\|ax + b\| = c$.	A.REI.B.3

Unit 3: Slopes and Lines

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

Enduring Understandings

- If two quantities vary proportionally, that relationship can be represented as a linear function.
- Mathematical rules (relations) can be used to assign members of one set to members of another set. A special rule (function) assigns members of one set to a unique member of another set.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- How can one determine rate of change for a linear equation displayed algebraically, graphically, numerically in tables, or by verbal descriptions?
- When is it appropriate to describe a rate of change as slope?
- How can one determine the equation for a line displayed algebraically, graphically, numerically in tables, or by verbal descriptions?
- How can linear equations be written given numerical or graphical information that defines the line?
- How can real-world situations be modeled by linear equations to help solve problems?

Lesson Title	Lesson Overview	Standards
Exploration Lesson: Which is Steepest?	Students will explore the idea of steepness of line segments.	
Rate of Change	Students will judge steepness of graphs of functions and define rate of change.	8.F.A.2 8.F.B.4
The Slope of a Line	Students will find the slope of a line from a graph.	8.EE.B.5 8.F.B.4
The Slope of a Line	Students will find the slope of a line given two points on a line.	8.EE.B.5 8.F.B.4

Properties of Slope	Students will make tables of values of functions and extend the table using the slope to find other points.	8.EE.B.5 8.F.B.4
Slope-Intercept Equations for Lines	Students will find an equation for a line given either its slope and any point or two points on it. Students will write an equation for a line in standard form or slope-intercept form, and using either form, find its slope and *y*-intercept.	8.EE.B.5 8.F.A.1 8.F.A.3 8.F.B.4
Slope-Intercept Equations for Lines	Students will model linear functions with slope-intercept form equations.	8.EE.B.5 8.F.A.1 8.F.A.3 8.F.B.4
Proportional Relationships and Equations of Lines	Students will explore the relationships between proportional relationships and equations of lines by analyzing various relations.	7.RP.A.2a 7.RP.A.2b 7.RP.A.2c 7.RP.A.2d
Equations for Lines with a Given Point and Slope	Students will determine the equation of a line given a point and a slope or points in a table of values.	8.F.A.3 8.F.B.4 A.CED.A.2
Equations for Lines Through Two Points	Students will determine the equation of a line given a point and a slope, two points, or points in a table of values.	8.F.A.3 8.F.B.4 A.CED.A.2
Standard Form of the Equation of a Line	Given the standard form of a line, students will determine the *x*- and *y*-intercepts to graph the line.	A.CED.A.2 A.CED.A.4
Graphing Linear Inequalities	Students will solve linear inequalities and will graph the solutions on a coordinate plane.	A.CED.A.3 A.REI.D.10 A.REI.D.12

Unit 4: Linear Systems

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

Enduring Understandings

- Mathematical situations and structures can be translated and represented abstractly using variables, expressions, and equations.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- How can real-world situations be modeled by systems of equations to help solve problems?
- What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically?
- What does the number of solutions (one, none or infinitely many) of a system of linear equations represent in the given context?

Lesson Title	Lesson Overview	Standards
An Introduction to Systems	Students will write real-world problems as systems of linear equations.	8.EE.C.8a A.CED.A.2
Solving Systems using Substitution	Students will solve systems of linear equations using substitution. Students will check their solutions.	8.EE.C.7a 8.EE.C.7b 8.EE.C.8a 8.EE.C.8b 8.EE.C.8c A.REI.C.6
More Uses of Substitution	Students will solve systems of linear equations. Given two coordinates for two pairs of points, students will determine whether the line through the first pair of points intersects the line through the second pair.	8.EE.C.7a 8.EE.C.7b 8.EE.C.8a 8.EE.C.8b 8.EE.C.8c A.REI.C.6

Solving Systems by Addition	Students will solve systems of linear equations by using addition.	8.EE.C.7a 8.EE.C.7b 8.EE.C.8a 8.EE.C.8b 8.EE.C.8c A.REI.C.6
Solving Systems by Multiplication	Students will solve systems of linear equations by using multiplication.	8.EE.C.7a 8.EE.C.7b 8.EE.C.8a 8.EE.C.8b 8.EE.C.8c A.REI.C.6
Systems and Parallel Lines	Students will solve simple systems by inspection. Students will solve systems that have one solution, no solution, or infinitely many solutions. Students will equate these to whether the lines are intersecting, parallel, or the same (coincident) line.	8.EE.C.8a 8.EE.C.8b
Systems of Inequalities	Students will solve systems of linear inequalities and will identify points in the solution set.	A.CED.A.3 A.REI.D.12

Unit 5: Linear and Exponential Modeling

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

Enduring Understandings

- Mathematical rules (relations) can be used to assign members of one set to members of another set. A special rule (function) assigns members of one set to a unique member of another set.
- There are special numerical measures that describe the center and spread of numerical data sets.

Essential Questions

- What is exponential growth and how does it differ from linear growth?
- How can one describe the relationship between data that is displayed algebraically, graphically, numerically in tables, or by verbal descriptions?
- How can real-world situations be modeled by exponential functions to help solve problems?

Lesson Title	Lesson Overview	Standards
Fitting a Line to Data	Students will make a scatter plot, find the line of best fit, and interpret the slope and intercept in the context of the problem. Students will perform this by hand and by using technology. Students will assess the fit of the line by examining the closeness of the data points to the line.	8.SP.A.1 8.SP.A.2 8.SP.A.3 S.ID.C.7
Interpreting Linear Models; Plotting and Analyzing Residuals	Students will interpret the slope (rate of change) and the *y*-intercept of a linear model in the context of the data. Students will gather and analyze authentic data and will discuss and distinguish between correlation and causation. Students will plot and analyze residuals.	S.ID.B.6 S.ID.C.7 S.ID.C.8 S.ID.C.9
Exploration Lesson	Students will explore the difference between linear growth and exponential growth.	

Compound Interest	Students will use exponential growth equations to calculate compound interest.	F.LE.A.1c F.LE.A.2
Exponential Growth	Students will use exponential growth equations to model and solve real-world and mathematical problems.	F.LE.A.1c F.LE.A.2 F.LE.B.5
Exponential Decay	Students will use exponential decay equations to model and solve real-world and mathematical problems. Students will compare different types of growth and decay – linear, exponential, and quadratic.	F.LE.A.1c F.LE.A.2 F.LE.B.5
Modeling Exponential Growth and Decay	Students will use exponential decay equations to model and solve real-world and mathematical problems. Students will model real-world and mathematical data with exponential equations.	A.SSE.B.3c F.LE.A.1a F.LE.A.1b F.LE.A.1c S.ID.B.6a

Unit 6: Analyzing Functions

Primary Resources: *Algebra*, Carnegie Learning, 2012, and *Algebra,* 3rd Ed., University of Chicago School Mathematics Project.

Enduring Understandings

- Mathematical rules (relations) can be used to assign members of one set to members of another set. A special rule (function) assigns members of one set to a unique member of the other set.
- Objects in space can be transformed in an infinite number of ways, and those transformations can be described and analyzed mathematically.

Essential Questions

- How do functions and relations differ?
- How can functions be used to model relationships between quantities?
- What are the effects of a translation on a function in the coordinate plane?
- How can real-world situations be modeled by functions to help solve problems?

Lesson Title	Lesson Overview	Standards
To Be or Not to Be a Function? – Defining and Recognizing Functions	Students will recognize if relations presented as mappings, sets of ordered pairs, tables, equations, and graphs are functions.	8.F.A.1 8.F.A.2 8.F.A.3 8.F.B.5
The Language of Functions	Students will complete tables of values to make a relation a function. Students will find domain and range of a function from graphs, tables, and equations. Students will restrict the domain and range of a function based on the context of the problem.	F.IF.A.1 F.IF.A.2 F.IF.B.5
Function Notation	Students will evaluate functions given a graph, a table, or an equation.	F.IF.A.2
Function Notation in Context	Students will interpret statements that use function notation in terms of a context, as well as relate the domain of a function to its graph and the relationship it describes.	F.IF.A.2 F.IF.B.5

Is There a Pattern Here? – Recognizing Patterns and Sequences	Students will describe and continue patterns and write numeric sequences to represent patterns and situations.	F.LE.A.1a F.LE.A.1b F.LE.A.1c
The Password is Operations – Arithmetic and Geometric Sequences	Students will generate the next terms for different sequences, and then sort these sequences based on common characteristics. Students will explore the definitions of arithmetic and geometric sequences. Students will extend arithmetic and geometric sequences and determine the common difference or common ratio.	F.LE.A.1a F.LE.A.1b F.LE.A.1c
Formulas for Arithmetic Sequences	Students will write explicit formulas for arithmetic sequences using subscript notation as well as function notation. Given an explicit or recursive formula, written in subscript notation or function notation, students will determine unknown terms of an arithmetic sequence.	F.IF.A.3 F.BF.A.1a F.LE.A.2
Formulas for Geometric Sequences	Students will write explicit formulas for geometric sequences using subscript notation as well as function notation. Given an explicit or recursive formula, written in subscript notation or function notation, students will determine unknown terms of an arithmetic sequence.	F.IF.A.3 F.BF.A.1a F.LE.A.2
Non-Linear Functions	Students will graph a variety of functions as well as interpret key features of their graphs.	F.IF.B.4 F.IF.B.5
Comparing Linear and Exponential Growth	Students will compare linear and exponential functions represented as graphs, tables, real-world scenarios, or equations.	F.IF.C.7a F.IF.C.7e F.LE.A.3

Comparing Linear and Exponential Functions	Students will compare linear and exponential functions while focusing on average rate of change.	F.LE.A.2
Translating Linear and Exponential Functions Vertically and Horizontally	Students will translate linear and exponential functions vertically and horizontally. Given a function and a translation to be performed, students will write the equation for the translated function. Students will recognize a translation based on provided function notation.	F.BF.B.3

Unit 7: Powers and Roots

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

Enduring Understandings

- Any number, measure, numerical expression, algebraic expression, or equation can be represented in an infinite number of ways that have the same value.
- Basic facts and algorithms for operations with rational numbers use notions of equivalence to transform calculations into simpler ones.

Essential Questions

- How are the properties of integer exponents used to simplify numerical and algebraic expressions?
- How is scientific notation used to describe very large or very small quantities and the relationship between quantities?
- What is the relationship between Pythagorean Theorem and the distance formula?
- How can real-world situations be modeled by powers to help solve problems?

Lesson Title	Lesson Overview	Standards
Products and Powers of Powers	Students will evaluate expressions involving powers.	8.EE.A.1 A.SSE.A.1a A.SSE.A.1b A.SSE.A.2
Quotients of Powers	Students will evaluate expressions involving powers.	8.EE.A.1 A.SSE.A.1a A.SSE.A.1b A.SSE.A.2
Negative Exponents	Students will evaluate expressions involving positive and negative powers.	8.EE.A.1 A.SSE.A.1a A.SSE.A.1b A.SSE.A.2

Powers of Products and Quotients	Students will evaluate expressions involving powers.	8.EE.A.1 A.SSE.A.1a A.SSE.A.1b A.SSE.A.2
Square Roots and Cube Roots	Students will define irrational numbers. Students will evaluate small perfect cube roots or small perfect cubes. Students will discuss primary and positive roots as having the same meaning.	8.EE.A.2
Square Roots and Cube Roots	Students will apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	8.EE.A.2 8.G.B.6 8.G.B.7
Multiplying and Dividing Square Roots	Students will evaluate and simplify square root expressions involving multiplication and division.	8.NS.A.2
Properties and Operations of Irrational and Rational Numbers	Students will 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 the product of a nonzero rational number and an irrational is irrational.	8.NS.A.1 8.NS.A.2 N.RN.B.3

Unit 8: Introduction to Quadratic Functions

Primary Resource: *Algebra*, Carnegie Learning, 2012.

Enduring Understandings

- Relationships can be described, and generalizations made for mathematical situations that have numbers of objects that repeat in predictable ways.
- Objects in space can be transformed in an infinite number of ways, and those transformations can be described and analyzed mathematically.

Essential Questions

- How can one determine the equation for a quadratic function displayed algebraically, graphically, numerically in a table, or by verbal descriptions?
- What are the effects of a dilation, translation, and/or reflection on a function in the coordinate plane?
- How can real-world situations be modeled by quadratic functions to help solve problems?

Lesson Title	Lesson Overview	Standards
Exploring Quadratic Functions	Students will model quadratic functions and explore graphical behavior. Students will use a graphing calculator to determine an absolute maximum or absolute minimum.	A.CED.A.1 A.CED.A.2 F.IF.B.4
Comparing Linear and Quadratic Functions	Students will identify function types by examining first and second differences of linear and quadratic functions in tables and graphs. Students will examine the leading term of functions to understand the effect that the sign has on the graph of the function.	A.CED.A.1 A.CED.A.2 A.SSE.A.1a A.SSE.A.1b F.IF.B.4 F.IF.B.6 F.LE.A.1a
Domain, Range, Zeros, and Intercepts	Students will identify the domain, range, zeros, and intervals of increase and decrease for a real-world situation that models vertical motion.	A.SSE.A.1a A.SSE.A.1b F.IF.B.4 F.IF.B.5 F.IF.C.7a

Domain, Range, Zeros, and Intercepts	Students will contrast the domain and range of a problem situation versus the domain and range of a function.	A.CED.A.1 A.CED.A.2 A.SSE.A.1a A.SSE.A.1b F.IF.B.4 F.IF.B.5 F.IF.C.7a
Factored Form of a Quadratic Function	Students will understand the relationship between a quadratic function written in factored form and its zeros. Students will compare the behaviors of the graph of the quadratic equation to the function written in factored form. Given *x*-intercepts, students will write quadratic functions in factored form.	A.CED.A.1 A.CED.A.2 A.SSE.A.1a A.SSE.B.3a F.IF.B.4 F.IF.C.7a
Investigating the Vertex of a Quadratic Function	Students will graph a quadratic function to determine its vertex and axis of symmetry. Students will use the axis of symmetry to determine additional points on the parabola.	A.CED.A.4 A.SSE.A.1a F.IF.B.4 F.IF.C.7a
Vertex Form of a Quadratic Function	Students will identify and compare the key characteristics of a quadratic function written in standard form, factored form, and vertex form. Given two functions written in standard form, students will complete graphic organizers by writing the functions in factored form and vertex form, and then identifying the key features of each form.	A.SSE.A.1a F.IF.B.4 F.IF.C.7a
Transformations of Quadratic Functions	Students will reflect, rotate, translate, and dilate the graph of a basic quadratic function.	F.BF.3 F.IF.C.7a

Unit 9: Polynomials and Quadratics

Primary Resource: *Algebra*, Carnegie Learning, 2012.

Enduring Understandings

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

Essential Questions

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

Lesson Title	Lesson Overview	Standards
Adding and Subtracting Polynomials	Students will classify monomials, binomials, and trinomials. Students will simplify polynomials by adding and subtracting them.	A.APR.A.1 A.CED.A. A.CED.A.2 A.SSE.A.1a F.BF.A.1b
Adding and Subtracting Polynomials	Students will model the sum of functions using function notation, a graph, a table, and finally, using algebra.	A.APR.A.1 A.CED.A.1 A.CED.A.2 A.SSE.A.1a F.BF.A.1b

Multiplying Polynomials	Students will multiply two binomials using algebra tiles, multiplication tables, and the Distributive Property.	A.APR.A.1
Factoring Polynomials	Students will write quadratic expressions as products of factors. Students will use GCF and multiplication tables to factor polynomials. Students will practice three different methods for factoring a quadratic trinomial.	A.APR.A.1 A.SSE.B.3a
Solving Quadratics by Factoring	Students will calculate the roots of a quadratic equation using the Zero Product Property.	A.REI.B.4b A.SSE.B.3a
Special Products	Students will factor polynomials in the forms of difference of two squares, perfect square trinomials, the difference of two cubes, and the sum of two cubes. Students will solve quadratic equations and functions.	A.SSE.A.2 A.SSE.B.3a
Approximating and Rewriting Radicals	Students will determine square roots, principal square roots, or positive square roots, negative square roots, and extracting the square root from both sides of an equation.	A.CED.A.1 A.REI.B.4b N.RN.A.2
Completing the Square	Students will solve any quadratic equation that is not factorable by the process of completing the square. Students will rewrite a quadratic equation written in standard form to vertex form by completing the square.	A.REI.B.4b A.SSE.B.3b F.IF.C.8a
The Quadratic Formula	Students will solve any quadratic equation that is not factorable by using the Quadratic Formula. Students will analyze the discriminant to predict the number of real zeros of a quadratic function or the number of x-intercepts of the graph of a quadratic equation.	A.CED.A.1 A.CED.A.2 A.REI.B.4a A.REI.B.4b

Unit 10: Synthesis of Modeling with Equations and Functions

Primary Resource: *Algebra I*, Module 5, Topics A and B, EngageNY.

Enduring Understandings

- Students synthesize what they have learned during the year about functions to select the correct function type in a series of modeling problems.
- Skills and knowledge from the year's work will support the work including writing, rewriting, comparing, and graphing functions and interpretation of the parameters of an equation.

Essential Questions

- How can functions describe real-world situations and be used to model predictions?
- How can we use data to model situations and solve problems?

Lesson Title	Lesson Overview	Standards
Analyzing a Graph	From a graphic representation, students will recognize the function type and interpret key features of the graph for functions addressed in previous modules (linear, exponential, quadratic, cubic, square root, cube root, absolute value, and other piecewise functions).	A.CED.A.2 F.IF.B.4 N.Q.A.2
Analyzing a Graph	From a graphic representation, students will create an equation or table to use as a model of the context for functions addressed in previous modules (linear, exponential, quadratic, cubic, square root, cube root, absolute value, and other piecewise functions).	A.CED.A.2 F.IF.B.4 N.Q.A.2
Analyzing a Data Set	Students will recognize linear, quadratic, and exponential functions when presented as a data set or sequence, and formulate a model based on the data.	A.CED.A.1 F.IF.B.4 F.IF.B.5 F.LE.A.1b F.LE.A.1c F.LE.A.2

Analyzing a Verbal Description	Students will make sense of a contextual situation that can be modeled with linear, quadratic, and exponential functions when presented as a word problem. Students will analyze a verbal description and create a model using equations, graphs, or tables.	A.CED.A.2 F.BF.A.1a F.BF.A.1b F.IF.B.4 F.IF.B.5 F.LE.A.1b F.LE.A.1c F.LE.A.2 N.Q.A.2
Modeling a Context from a Graph	Students will create a two-variable equation that models the graph from a context. Function types include linear, quadratic, exponential, square root, cube root, and absolute value.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.BF.A.1b F.IF.B.4 F.IF.B.5 F.IF.B.6 N.Q.A.2 N.Q.A.3
Modeling a Context from a Graph	Students will interpret the graph and function and answer questions related to the model, choosing an appropriate level of precision in reporting their results.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.BF.A.1b F.IF.B.4 F.IF.B.5 F.IF.B.6 N.Q.A.2 N.Q.A.3

Modeling from a Sequence	Students will recognize when a table of values represents an arithmetic or geometric sequence. Patterns are present in tables of values.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.LE.A.2
Modeling from a Sequence	Students will choose and define the parameter values for a function that represents a sequence.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.LE.A.2
Modeling a Context from Data	Students will write equations to model data from tables, which can be represented with linear, quadratic, or exponential functions. Students will recognize when a set of data can be modeled with a linear, exponential, or quadratic function and create the equation that models the data. Students will interpret a function in terms of the context in which it is presented, make predictions based on the model, and use an appropriate level of precision for reporting results and solutions.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.BF.A.1b F.IF.B.4 F.IF.B.5 F.IF.B.6 F.LE.A.2 N.Q.A.2 N.Q.A.3
Modeling a Context from Data	Students will use linear, quadratic, and exponential functions to model data from tables, and choose the regression most appropriate to a given context. Students will use the correlation coefficient to determine the accuracy of a regression model and then interpret the function in context. Students will make predictions based on their model and use an appropriate level of precision for reporting results and solutions.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.BF.A.1b F.LE.A.2 N.Q.A.2 N.Q.A.3

Modeling a Context from a Verbal Description	Students will model functions described verbally in a given context using graphs, tables, or algebraic representations.	F.BF.A.1a F.BF.A.1b F.LE.A.2 N.Q.A.2 N.Q.A.3
Modeling a Context from a Verbal Description	Students will interpret the function and its graph and use them to answer questions related to the model, including calculating the rate of change over an interval, and always using an appropriate level of precision when reporting results. Students will use graphs to interpret the function represented by the equation in terms of the context, and answer questions about the model using the appropriate level of precision in reporting results.	A.CED.A.1 A.CED.A.2 F.BF.A.1a F.BF.A.1b F.IF.B.4 F.IF.B.5 F.IF.B.6 F.LE.A.2 N.Q.A.2 N.Q.A.3

Unit 11: Mathematical Modeling

Primary Resource: *Algebra*, Carnegie Learning, 2012.

Enduring Understandings

- Some questions can be answered by collecting and analyzing data and the question to be answered determines the data that needs to be collected and how best to collect it.
- Data can be represented visually using tables, charts, and graphs. The type of data determines the best choice of visual representation.

Essential Questions

- What questions should I be asking to best analyze a set of data and how can I best communicate the results of these questions?
- How can real-world data be represented and summarized to help solve problems?

Lesson Title	Lesson Overview	Standards
Modeling Using Exponential Functions	Students will use a graphing calculator to determine the regression equation of exponential data and then use the function to make predictions about each situation.	F.IF.B.4 F.IF.B.5 F.IF.C.7e F.BF.A.1a F.LE.A.1a F.LE.A.1c F.LE.A.2
Modeling Stopping Distances and Reaction Times	Students will choose the best regression equations to model problem situations. Students will consider linear, exponential, and quadratic regressions, and to analyze the correlation coefficients of each to determine the equations of the curves that best fit the data.	F.IF.B.4 F.IF.B.5 F.IF.C.7e F.BF.A.1a F.LE.A.1a F.LE.A.1c F.LE.A.2

Using Quadratic Functions to Model Data	Students will choose the best regression functions to model problem situations. Students will analyze the correlation coefficients to verify their choices. Students will focus on considering additional data values in terms of a problem situation. Students will re-evaluate regression equations and correlation coefficients to determine if the function chosen originally is still the function that best fits the situation.	F.IF.B.4 F.IF.B.5 F.IF.C.7e F.BF.A.1a F.LE.A.1a F.LE.A.1c F.LE.A.2
Choosing a Function to Model BAC	Students will determine the type of regression functions that best fit a graph. Students will analyze the results and then write a report about their conclusions.	F.IF.B.4 F.IF.B.5 F.IF.C.7e F.BF.A.1a F.LE.A.1a F.LE.A.1c F.LE.A.2

Unit 12 Interpreting Categorical and Quantitative Data

Primary Resource: HCPS Insert Lessons

Enduring Understandings

- Some questions can be answered by collecting and analyzing data and the question to be answered determines the data that needs to be collected and how best to collect it.
- There are special numerical measures that describe the center and spread of numerical data sets.

Essential Questions

- What questions should I be asking to best analyze this set of data and how I can best communicate the results of these questions?
- What are the measures of central tendency and the measures of spread for this data set and how can I display them in an effective and coherent manner?
- How can real-world data be represented and summarized to help solve problems?

Lesson Title	Lesson Overview	Standards
Summarize, Represent and Interpret Data on a Single Count	Students will review measures of central tendency: mean, median, and mode.	S.ID.A.1 S.ID.A.2 S.ID.A.3
Standard Deviation	Students will examine the standard deviation as a measure of spread of data.	S.ID.A.2
Associations of Bivariate Categorical Data	Students will understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Students will construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Students will use relative frequencies calculated for rows or columns to describe possible association between the two variables.	8.SP.A.4
Summarize and Interpret Categorical Data	Students will use a frequency table that summarizes categorical data to analyze and interpret data.	S.ID.B.5

Unit 13: Volume

Primary Resource: *Grade 7 Mathematics*, Module 5, Topic B and Module 6, Topics C and E, EngageNY.

Enduring Understandings

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

Essential Questions

- How can the volume of three-dimensional objects be used to solve real world problems?

Lesson Title	Lesson Overview	Standards
Slicing a Right Rectangular Prism with a Plane	Students will describe rectangular regions that result from slicing a right rectangular prism by a plane perpendicular to one of the faces.	7.G.A.3
Slicing a Right Rectangular Pyramid with a Plane	Students will describe polygonal regions that result from slicing a right rectangular pyramid by a plane perpendicular to the base and by another plane parallel to the base.	7.G.A.3
Slicing on an Angle	Students will describe polygonal regions that result from slicing a right rectangular prism or pyramid by a plane that is not necessarily parallel or perpendicular to the base.	7.G.A.3
Understanding Three-Dimensional Figures	Students will describe three-dimensional figures built from cubes by looking at horizontal slicing planes.	7.G.A.3
Volume of Right Prisms	Students will use the formula $V = Bh$ to determine the volume of a right prism. Students will identify the base and compute the area of the base by decomposing it into pieces.	7.G.B.6

Volume of Composite Three-Dimensional Objects	Students will compute volumes of three-dimensional objects composed of right prisms by using the fact that volume is additive.	7.G.B.6
Real-World Volume Problems	Students will use the volume formula for a right prism ($V = Bh$) to solve volume problems involving rate of flow.	7.G.B.6
Examples of Functions from Geometry	Students will write rules to express functions related to Geometry. Students will review what they know about volume with respect to rectangular prisms and further develop their conceptual understanding of volume by comparing liquid contained within a solid to the volume of a standard rectangular prism (i.e., a prism with base area equal to one).	7.G.B.6
Volumes of Familiar Solids – Cones and Cylinders	Students will use the volume formulas for cones and cylinders. Students will apply the formulas for volume to real-world and mathematical problems.	8.G.C.9
Volumes of Spheres	Students will use the volume formula for a sphere as it relates to a right circular cylinder with the same diameter and height. Students will apply the formula for the volume of a sphere to real-world and mathematical problems.	8.G.C.9