Algebra 1 POR: Cover Page

Content Area: **Mathematics**
Course(s):
Time Period:
Length: **31 - 44 weeks**
Status: **Published**

Table of Contents & Timeline

Statement of Purpose

Algebra 1 POR is designed to provide students with the prerequisite skills that provide a foundation for future mathematics courses. This course will also expose students to applications that can be applied to their future lives and various career paths. Students will explore arithmetic skills, statistics, various equation families (linear, quadratic, polynomial, and rational) as well as sequences and series. While exploring these topics, students will connect concepts to real-world examples while utilizing technology and exploring cross-curricular applications.

Unit 1 – Summer Review

Content Area: **Mathematics**
Course(s): **Algebra 1**
Time Period: **1st Marking Period**
Length: **2-3 Weeks**
Status: **Published**

Summary of the Unit

Students will be expected to recall material learned in prior grades and demonstrate their understanding of the material covered in the Algebra 1 Summer Review packet

Enduring Understandings

Review, apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

To use the properties of the coordinate plane and ordered pairs to communicate and locate specific locations.

Essential Questions

How can operations be used to solve real-life problems?

How can you use the coordinate plane and its properties in real-life situations?

Summative Assessment and/or Summative Criteria

Homework: May be given on each introduced topic/content area

Class Discussion: Students will be expected to be prepared for class, participate in class activities, and actively engage in discussions with their peers and teachers

Exit Tickets, Graphic Organizers, Writing Prompts, Communicating Your Answers Questions, 3-2-1 Reflection Sheets, Point of Most Significance

Questions, Phone Message Activities, etc.: To be given daily on each introduced topic/content area

Teacher Observation: To be done on each introduced topic/content area

Students will demonstrate mastery through various assessment criteria within the unit per teacher discretion which may include short constructed responses, multiple-choice items, drag and drop questions, fill in the blanks, etc.

District/State Assessments

Resources

SWMHS Algebra 1 Summer Review

Big Ideas Math High School Algebra 1 (2015)

Achieve the Core

Desmos

Oncourse Assessments

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards NJSLS

Basic mathematical operations review (Addition, Subtraction, Multiplication, Division) with integers and rational numbers 3 – 4 days	SWBAT add, subtract, multiply, divide integers and rational numbers using order of operations, commutative and associative properties of addition and multiplication, the multiplicative identity, and multiplicative inverse or reciprocal properties	Review the terminology related to basic operations: addition, subtraction, multiplication, division, order of operations, etc. Review operation properties of equality Use both vertical and horizontal methods Use visual strategies to represent the rules of signed numbers Use hands on manipulatives to create practice problems (i.e. cards, dice) Model example problems. Have students explain their steps either written or verbally Use basic mathematical operations to	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems	5.OA.A.1 7.NS.A

		calculate the measurement quantities of trees in an area and/or problems involving glacial retreat.		
Distribution Property, combining like terms, and evaluating expressions review 3 – 4 days	SWBAT arithmetic and algebraic expressions using the distributive property of multiplication over addition or subtraction; identify and combine like terms; evaluate algebraic expressions	Define and model the distribution property Compare/contrast 'like terms' and 'not like terms' Explain substitution and use mathematical models to demonstrate real-world use	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework	HS.A.SSE.1 5.OA.A.2 7.EE.B.3 8.EE.C.7b

		Use hands on manipulatives to create practice problems (i.e. cards, dice) Have students explain their steps either written or verbally	Application of real-life problems Performance Assessment	
Coordinate Plane review 2 – 3 days	SWBAT plot points on the coordinate plane and write ordered pairs when given a point on a coordinate plane	Define ordered pair Review properties of ordered pairs in each of the 4 quadrants Use a variety of maps to model real-life applications of ordered pairs Have students explain their steps either written or verbally Explore the correlation of melting glaciers and the rise in sea level	Observation Homework Application of real-life problems	6.NS.C.5 6.NS.C.6

Review and Assessment 2 days	SWBAT simplify and evaluate mathematical expressions SWBAT locate points on a coordinate plane when given and ordered pair SWBAT write the ordered pair of a point when the given point is on the coordinate plane	Practice test - review	Formal assessment using selected questions from the Algebra 1 review summer assignment	5.OA.A.1 5.OA.A.2 6.NS.C.5 6.NS.C.6 7.EE.B.3 7.NS.A 8.EE.C.7b HS.A.SSE.1

MA.5.OA.A.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
MA.5.OA.A.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
MA.6.NS.C.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.NS.A	Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
MA.8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Suggested Modifications for Special Education, ELL and Gifted Students

Consistent with individual plans, when appropriate.

Below-level learners can be provided with graphic organizers, vocabulary cards, study guides, and printed notes.

Projects can be modified or leveled as needed.

Restructure lessons using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA);

Structure lessons around questions that are authentic, and relate to students' interests, social/family background, and knowledge of their community.

Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques: auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling)

Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as Webex/Google Meet, experts from the community helping with a project, journal articles, and biographies).

Provide multiple grouping opportunities for students to share their ideas and encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

Engage students with a variety of trade/employment practices (based on student interests in the class) to provide students with multiple entry points and multiple ways to demonstrate their understandings.

Use project-based science learning to connect science with observable phenomena; Structure the learning around explaining or solving a social or community-based issue.

Provide ELL students with multiple literacy strategies including websites with various language options.

Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

Big Ideas Math

Desmos

Khan Academy

EdPuzzle

Cross Curricular/21st Century Connections

9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

9.3: This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Unit 2 – Linear Relationships

Content Area: **Mathematics**
Course(s): **Algebra 1**
Time Period: **2nd Marking Period**
Length: **12-14 Weeks**
Status: **Published**

Summary of the Unit

Students will graph and interpret relationships within linear equations/inequalities in order to solve real-life problems.

Enduring Understandings

Creating, solving, and analyzing expressions and equations involving arithmetic operations is an essential skill necessary in order to apply mathematics to the real-world.

The study of linear equations and inequalities allows for identifying and interpreting the relationship between two dependent variables.

Relationships between two or more functions exist throughout the real-world.

Essential Questions

How can you use simple and multi-step equations/inequalities to solve real-life problems?

Given the graph of a linear function, how can you write an equation of the line?

Can you use linear equations/inequalities to solve real-life problems?

What is a function?

How can you describe the graph of the equation $y = mx + b$?

How does the graph of the linear function $f(x) = x$ compare to the graphs of $g(x) = f(x) + c$ and $h(x) = f(cx)$?

Given the graph of a linear function, how can you write an equation of the line?

How can you write an equation of a line when you are given the slope and a point on the line?

How can you use substitution/elimination to solve a system of linear equations?

How can you discover the number of solutions to a linear system?

Summative Assessment and/or Summative Criteria

Homework: May be given on each introduced topic/content area

Class Discussion: Students will be expected to be prepared for class, participate in class activities, and actively engage in discussions with their peers and teachers

Exit Tickets, Graphic Organizers, Writing Prompts, Communicating Your Answers Questions, 3-2-1 Reflection Sheets, Point of Most Significance

Questions, Phone Message Activities, etc.: To be given daily on each introduced topic/content area

Teacher Observation: To be done on each introduced topic/content area

Students will demonstrate mastery through various assessment criteria within the unit per teacher discretion which may include short constructed responses, multiple-choice items, drag and drop questions, fill in the blanks, etc.

District/State Assessments

Resources

Big Ideas Math High School Algebra 1 (2015)

Achieve the Core

Desmos

Oncourse Assessments

Graphing Calculator (i.e. TI-83 or TI-84)

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards NJSLS
Writing and Solving one – & two – step equations 3 – 5 days	SWBAT write and solve one & two step equations	Review the following terminology related to solving equations: inverse, simplify Have students identify inverse operations Model example problems Students may solve real-world problems by writing and solving one-variable equations related to deforestation and/or increasing livestock farming as contributors to climate change.	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems	A.CED.1 A.SSE.1 A.SSE.2 A.REI.1 N.Q.1 N.Q.2 N.Q.3
Writing and solving multistep	SWBAT write and solve muti-	Review all terminology related to solving	Observation	A.CED.1

equations 3 – 5 days	step equations	equations: order of operations Have students identify inverse operations Model example problems	Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems	A.SSE.1 A.SSE.2 A.REI.1 N.Q.1 N.Q.2 N.Q.3
Writing and solving multistep equations with variable on both sides of the equal sign 5 days	SWBAT write and solve muti-step equations when the variable on both sides of the equal sign	Review all terminology related to solving equations and distributive property: multiplication, combine line terms Have students identify inverse operations Model example problems Students may solve multi-step real-life problems posed with positive and negative rational numbers in any form related to the relationship between altitude and the temperature above sea level.	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems Performance Assessment	A.CED.1 A.SSE.1 A.SSE.2 A.REI.1 N.Q.1 N.Q.2 N.Q.3
Solving literal equations and formulas for a	SWBAT solve a formula for a specific	Assign meaning to variables	Observation	A.CED.2

specific value/variable 5 days	variable.	Have students identify which variable needs to be isolated Have students identify inverse operations Model example problems Students may rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations.	Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems	A.CED.4 A.SSE.1 A.SSE.2 A.REI.1 A.REI.3 N.Q.1 N.Q.2 N.Q.3
Writing, solving, and evaluating linear equations in slope-intercept form and point-slope form 10 days	SWBAT write, solve and evaluate a linear equation to determine and interpret the slope and y-intercept	Introduce equations Have students identify variables Model example problems	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems Performance Assessment	A.CED.1 A.CED.2 A.CED.4 A.SSE.1 A.SSE.2 A.REI.1 A.REI.3 N.Q.1 N.Q.2 N.Q.3

Writing, solving, and evaluating inequalities using a number line 10 days	SWBAT write, solve, and evaluate linear inequalities on a number line to determine all possible solutions	Review equations Introduce and define inequalities Have students identify variables Use visual strategies to represent inequalities on a number line Model example problems	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems Performance Assessment	A.CED.1 A.CED.2 A.CED.4 A.SSE.1 A.SSE.2 A.REI.1 A.REI.3 N.Q.1 N.Q.2 N.Q.3
Writing, solving, and evaluating linear inequalities 5 days	SWBAT write, solve and evaluate a linear inequality to determine and interpret the slope, y-intercept, and solution area	Review equations/inequalities Have students identify variables Model example problems	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems	A.CED.1 A.CED.2 A.CED.4 A.SSE.1 A.SSE.2 A.REI.1 A.REI.3 N.Q.1 N.Q.2 N.Q.3

			Performance Assessment	
Solving Systems of Linear Equations by Graphing 5 days	SWBAT solve systems of linear equations by identifying and analyzing the solution	Review the following terminology related to solving systems of linear equations by graphing: slope, y-intercept, types of slope, types of solutions Model example problems Have students discover ways to determine if a system of equations has one solution, no solution, or infinitely many solutions through graphing using teacher chosen/created materials Students can compare the efficiency of a variety of renewable energy sources to fossil fuel	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework Application of real-life problems Performance Assessment	F.IF.C.7a A.REI.B.3
Solving Systems of Linear Inequalities by Graphing 5 – 8 days	SWBAT solve systems of linear inequalities by identifying and analyzing the solution area	Review the following terminology related to solving systems of linear equations by graphing: slope, y-intercept, solution area, inequality symbols Model example problems Have students discover the solution area to a system of linear inequalities by having them test solution points	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework	F.IF.C.7a A.REI.B.3

			Application of real-life problems Performance Assessment	
Solving Systems of Linear Equations using Substitution 5 days	SWBAT solve systems of linear equations using substitution, check if points are a solution to the system, and model real world examples	Review the following terminology related to solving systems of linear equations by substitution: solving equations, identifying variables, substitution Model example problems Have students discover ways to determine if a system of equations has one solution, no solution, or infinitely many solutions through graphing using teacher chosen/created materials	Observation Use of technology to support instruction Classwork Homework Application of real-life problems Performance Assessment	CED.A.3 MA.A-REI.C.6
Solving Systems of Linear Equations using Elimination 5 – 8 days	SWBAT solve systems of linear equations using elimination, check if points are a solution to the system, and model real world examples	Review the following terminology related to solving systems of linear equations by elimination: identifying variables, elimination, substitution Model example problems Have students discover ways to determine if a system of equations has one solution, no solution, or infinitely many solutions through graphing using teacher	Observation Use of technology to support instruction Use of manipulatives to support instruction Classwork Homework	A-CED.A.3 REI.C.5 REI.C.6

		chosen/created materials	Application of real-life problems Performance Assessment	

MA.N-Q.A.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.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.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.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.A-REI.C.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.
MA.A-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
MA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Suggested Modifications for Special Education, ELL and Gifted Students

Consistent with individual plans, when appropriate.

Below-level learners can be provided with graphic organizers, vocabulary cards, study guides, and printed notes.

Projects can be modified or leveled as needed.

Restructure lessons using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA);

Structure lessons around questions that are authentic, and relate to students' interests, social/family background, and knowledge of their community.

Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques: auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling)

Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as Webex/Google Meet, experts from the community helping with a project, journal articles, and biographies).

Provide multiple grouping opportunities for students to share their ideas and encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

Engage students with a variety of trade/employment practices (based on student interests in the class) to provide students with multiple entry points and multiple ways to demonstrate their understandings.

Use project-based science learning to connect science with observable phenomena; Structure the learning around explaining or solving a social or community-based issue.

Provide ELL students with multiple literacy strategies including websites with various language options.

Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

Big Ideas Math

Desmos

Khan Academy

EdPuzzle

Graphing Calculator (i.e. TI-83 or TI-84)

Internet Resources

Cross Curricular/21st Century Connections

9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

9.3: This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Unit 3 – Quadratic Equations and Polynomials

Content Area: **Mathematics**
Course(s): **Algebra 1**
Time Period: **3rd Marking Period**
Length: **6-10 Weeks**
Status: **Published**

Summary of the Unit

In this unit, students will identify, classify, add, subtract, multiply, and write polynomials expressions and equations. Students will graph and solve quadratic functions using various methods including factoring, square roots, the quadratic formula, and visual representations. Students will utilize these skills to solve real-world problems.

Enduring Understandings

The properties of integers apply to polynomials.

Multiplying and factoring polynomials are related.

Solving polynomials involves the reversal of operations, the distributive property, and rules of exponents.

The graph of quadratic equations has many uses in the real-world.

Essential Questions

How can you add, subtract, and multiply polynomials?

What is the relationship between the distributive property and the concept of factoring out a common factor from an expression?

What are some characteristics of a graph of a quadratic and how can you tell those characteristics from the equation?

Summative Assessment and/or Summative Criteria

Homework: May be given on each introduced topic/content area

Class Discussion: Students will be expected to be prepared for class, participate in class activities, and actively engage in discussions with their peers and teachers

Exit Tickets, Graphic Organizers, Writing Prompts, Communicating Your Answers Questions, 3-2-1 Reflection Sheets, Point of Most Significance

Questions, Phone Message Activities, etc.: To be given daily on each introduced topic/content area

Teacher Observation: To be done on each introduced topic/content area

Students will demonstrate mastery through various assessment criteria within the unit per teacher discretion which may include short constructed responses, multiple-choice items, drag and drop questions, fill in the blanks, etc.

District/State Assessments

Resources

Big Ideas Math High School Algebra 1 (2015)

Achieve the Core

Desmos

Oncourse Assessments

Graphing Calculator (i.e. TI-83 or TI-84)

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards NJSLS
Adding and Subtracting Polynomials 3 – 5 days	SWBAT identifying polynomials based on degree, number of terms, and leading coefficient, add and subtract polynomials, and solve real world examples	Review the following terminology related to polynomials: degree, number of terms, leading coefficient, combine like terms, simplify Students will add and subtract polynomials. Students may add/subtract vertically or horizontally Students will solve real-life problems	Observation Use of manipulatives to support instruction Performance Assessment	A.APR.A.1
Multiplying Polynomials 3 – 5 days	SWBAT multiply polynomials	Model example problems for students using the Distributive Property. Model example problems for students using the Box Method. Remind students that after multiplying they may have to add or subtract like terms.	Observation Use of manipulatives to support instruction Performance Assessment	A.APR.A.1
Factoring Polynomials Using Greatest Common Factor 3 – 5 days	SWBAT identify and divide the greatest common factor using "undistribution"	Define factoring as a form of division Define the greatest common factor as the number/term that can evenly divide all	Observation Use of manipulatives to support instruction Performance Assessment	A.APR.B.3a

		monomials Students will identify common factors between numbers and monomials Students will factor using the GCF Model examples		
Factoring based on number of terms 10 – 15 days	Students will identify binomials, trinomials, and 4-term polynomials and use various factoring methods to factor completely	Expose students to various factoring methods: GCF, AC grouping, Box method, T-Chart, Difference of Squares, etc. Model examples of each Model examples involving multiple factoring techniques Remind students that polynomials need to be factored completed and may have to be factored more than once Have students complete interactive notebooks or flowcharts of various factoring techniques Have students multiply their factored answers in order to prove they	Observation Use of manipulatives to support instruction Use of technology to support instruction Performance Assessment Written Assessment	A.SSE.A.2 A.APR.B.3a

		have factored property		
Solving Polynomial Equations 2 – 4 days	SWBAT solve quadratic equations by factoring	Relate factoring techniques to solving polynomial equations Model example problems Solve real-world examples	Observation Performance Assessment	A.APR.B.3 A.REI.B.4b
Graphing Quadratic Functions 3 – 5 days	SWBAT identify characteristics of quadratic functions, identify functions in various forms, and graph quadratic equations	Review the following terminology related to graphing quadratic functions: leading coefficient, positive/negative functions, parabola, symmetry, coordinates, table of values, zeros, solutions, x-intercepts, vertex, etc. Model examples using standard form, vertex form, and intercept form Model examples using a table of values Allow student to use technology to graph functions	Use of technology to support instruction Written Assessment	A.CED.A.2 F.IF.C.7a F.IF.C.9
Solving Quadratic Functions by Graphing 2 – 4 days	SWBAT identify solutions (x-intercepts) of a quadratic equations using the graph	Review the following terminology related to solving quadratic functions by graphing: zeros, roots, solutions, x-intercepts, etc.	Use of technology to support instruction Performance Assessment	A.REI.D.11 F.IF.C.7a

		Have students participate in a discovery activity where they find possible solutions to a quadratic function: one solution, two solutions, or no solution Model example problems		
Using Square Roots to Solve Quadratic Equations 2 – 4 days	Students will solve quadratic equations by finding square roots	Review perfect squares Review properties of radicals Model example problems Have students discover why when using square roots, the solution should always be ± and when the solution could be no real solution Students may create equations and/or inequalities to represent the economic impact of climate change.	Observation Written Assessment	A.CED.A1 A.CED.A.4 A.REI.B.4b
Solving Polynomial Equations using	Students will solve quadratic equations using the quadratic	Review the following terminology related to solving quadratic	Observation Use of technology to	A.CED.A.1

the Quadratic Formula 2 – 4 days	formula	equations using the quadratic formula: quadratic equation, quadratic formula, substitution, order of operations, etc. Model example problems Have students use technology to check their solutions	support instruction Written Assessment	A.REI.B.4a A.REI.B.4a

MA.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.A-APR.A.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.
MA.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MA.A-REI.B.4a	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.
MA.A-REI.B.4b	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 $a \pm bi$ for real numbers a and b.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Suggested Modifications for Special Education, ELL and Gifted Students

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Provide multiple grouping opportunities for students to share their ideas and encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

Engage students with a variety of trade/employment practices (based on student interests in the class) to provide students with multiple entry points and multiple ways to demonstrate their understandings.

Use project-based science learning to connect science with observable phenomena; Structure the learning around explaining or solving a social or community-based issue.

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Desmos

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9.3: This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Unit 4 – Exponential Functions, Radical Equations, & Sequences & Series

Content Area: **Mathematics**
Course(s): **Algebra 1**
Time Period: **4th Marking Period**
Length: **7-12 Weeks**
Status: **Published**

Summary of the Unit

In this unit, students will focus on the properties of exponents and simplifying rational and radical expressions. Students will also graph and write rules for exponential functions, including exponential growth and exponential decay functions. Finally, students will use the skills learned to identify, compare, and contrast functions.

Enduring Understandings

Use properties of exponents and radicals to simplify expressions.

Perform operations with exponents and radicals to solve real-world problems.

Patterns, functions, and relationships can be represented graphically, numerically, symbolically, or verbally.

Essential Questions

How are radicals written as exponents and why is it important to be able to covert from radical expression to rational expression?

What does the concept of a negative exponent mean, as it relates to the size of a number or where the variable should be in a quotient?

What is the importance of being able to write and graph equations for exponential growth and decay functions?

How are exponential growth and decay functions used in the real-world?

Summative Assessment and/or Summative Criteria

Homework: May be given on each introduced topic/content area

Class Discussion: Students will be expected to be prepared for class, participate in class activities, and actively engage in discussions with their peers and teachers

Exit Tickets, Graphic Organizers, Writing Prompts, Communicating Your Answers Questions, 3-2-1 Reflection Sheets, Point of Most Significance

Questions, Phone Message Activities, etc.: To be given daily on each introduced topic/content area

Teacher Observation: To be done on each introduced topic/content area

Students will demonstrate mastery through various assessment criteria within the unit per teacher discretion which may include short constructed responses, multiple-choice items, drag and drop questions, fill in the blanks, etc.

District/State Assessments

Resources

Big Ideas Math High School Algebra 1 (2015)

Achieve the Core

Desmos

Oncourse Assessments

Graphing Calculator (i.e. TI-83 or TI-84)

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards NJSLS
Properties of Exponents 3 – 5 days	SWBAT use zero and negative exponents, use properties of exponents to simplify expressions and, solve real-life problems involving exponents	Create a graphic organizer for exponent rules Model example problems	Observation Use of technology to support instruction Use of manipulatives to support instruction	N.RN.A.2
Simplifying Radical Expressions 3 – 5 days	SWBAT find nth roots	Define roots Model example problems Create factor trees	Performance Assessment	N.RN.A.2
Simplifying Rational Exponents 2 – 4 days	SWBAT evaluate expressions with rational exponents	Create a graphic organizer for exponent rules Model example problems	Observation Use of technology to support instruction	A.APR.D.6 N.RN.A.1 N.RN.A.2
Operations with Radicals & Rational Exponents 10 days	SWBAT will use the properties of radicals to simplify expressions, simplify expressions by rationalizing the denominator and perform operations with radicals.	Model example problems Students will discover why some expressions need to be rationalized or cannot be simplified	Observation Performance Assessment	F.IF.B.4 F.IF.C.7e
Solving Square/Cube	SWBAT will solve radical equations, identify extraneous	Model example problems	Observation Performance Assessment	A.CED.A.1 A.REI.A.1

Root Equations 5 days	solutions, and solve real-life problems involving radical equations	Students will discover why some solutions are considered extraneous Students may create equations and/or inequalities to represent the economic impact of climate change.		A.REI.D.11
Graphing Square/Cube Root Equations 5 days	SWBAT graph square and cube root functions, compare functions using the average rate of change and solve real world problems involving square/cube roots	Use table of value to graph square and cube root functions Create a graphic organizer to identify characteristics of functions	Observation Use of technology to support instruction Use of manipulatives to support instruction Performance Assessment	A.CED.A.2
Graphing Exponential Functions 2 – 4 days	SWBAT identify and evaluate exponential functions, graph exponential functions, and solve real world problems	Model example problems Allow students to use technology to graph functions	Observation Use of technology to support instruction	F.IF.C.7c
Exponential Growth & Decay 5 – 10 days	SWBAT identify growth and decay functions, interpret and rewrite exponential growth and decay functions, and solve real-world problems involving exponential growth and decay functions	Define growth, and decay and compare linear to exponential growth/decay Graph/identify growth and decay functions	Observation Use of technology to support instruction Performance Assessment	F.IF.C.7e F.IF.C.8b 8.1.12 DA.5

		Model real-world examples such as car/technology depreciation, investment rates, etc.		
Arithmetic Sequences & Series 3 – 5 days	SWBAT write the terms of arithmetic sequences, graph arithmetic sequences, and write arithmetic sequences as functions	Model example problems Identify sequences as arithmetic Write arithmetic sequences based on the provided information Research difference sequences in nature	Observation Use of technology to support instruction Performance Assessment	F.IF.A.3 F.BF.A.2 F.BF.A.1a F.LE.A.2
Geometric Sequences & Series 3 – 5 days	SWBAT identify geometric sequences, extend and graph geometric sequences, and write geometric sequences as functions	Model example problems Identify sequences as geometric Write geometric sequences based on the provided information Research difference sequences in nature	Observation Use of technology to support instruction Performance Assessment	F.IF.A.3 F.BF.A.2 F.BF.A.1a F.LE.A.2

MA.F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
MA.F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
MA.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
MA.F-IF.B.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.
MA.F-IF.C.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
MA.N-RN.A.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.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.A-APR.D.6	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x)$ + $r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MA.A-REI.D.11	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.

Suggested Modifications for Special Education, ELL and Gifted Students

Consistent with individual plans, when appropriate.

Below-level learners can be provided with graphic organizers, vocabulary cards, study guides, and printed notes.

Projects can be modified or leveled as needed.

Restructure lessons using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA);

Structure lessons around questions that are authentic, and relate to students' interests, social/family background, and knowledge of their community.

Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques: auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling)

Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as Webex/Google Meet, experts from the community helping with a project, journal articles, and biographies).

Provide multiple grouping opportunities for students to share their ideas and encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

Engage students with a variety of trade/employment practices (based on student interests in the class) to provide students with multiple entry points and multiple ways to demonstrate their understandings.

Use project-based science learning to connect science with observable phenomena; Structure the learning around explaining or solving a social or community-based issue.

Provide ELL students with multiple literacy strategies including websites with various language options.

Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

Big Ideas Math

Desmos

Khan Academy

EdPuzzle

Graphing Calculator (i.e. TI-83 or TI-84)

Internet Resources

Cross Curricular/21st Century Connections

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9.3: This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Unit 5 – Statistics

Content Area: **Mathematics**
Course(s): **Algebra 1**
Time Period: **4th Marking Period**
Length: **4-5 Weeks**
Status: **Published**

Summary of the Unit

Students will be expected to display and analyze statistical data in various representations including frequency tables, box-and-whisker plots, histograms, distribution curves, and two-way tables. Students will classify data and choose an appropriate way to display the data for its best representation. Students will also analyze data representations to determine if the data is represented in a way to influence a particular perspective.

Enduring Understandings

Analyze data representations to determine if the data is represented in a way to influence a particular perspective.

Analyze data in various ways to determine the likelihood of possible outcomes and averages.

Essential Questions

How can operations be used to solve real-life problems?

How can you use the coordinate plane and its properties in real-life situations?

Summative Assessment and/or Summative Criteria

Homework: May be given on each introduced topic/content area

Class Discussion: Students will be expected to be prepared for class, participate in class activities, and actively engage in discussions with their peers and teachers

Exit Tickets, Graphic Organizers, Writing Prompts, Communicating Your Answers Questions, 3-2-1

Reflection Sheets, Point of Most Significance

Questions, Phone Message Activities, etc.: To be given daily on each introduced topic/content area

Teacher Observation: To be done on each introduced topic/content area

Students will demonstrate mastery through various assessment criteria within the unit per teacher discretion which may include short constructed responses, multiple-choice items, drag and drop questions, fill in the blanks, etc.

District/State Assessments

Resources

Big Ideas Math High School Algebra 1 (2015)

Achieve the Core

Desmos

Oncourse Assessments

Current Events

Statista Industry Overview (for data specific to students interests)

Videos

What is a Box-Whisker Plot?

How to make a Box-Whisker Plot?

What is a histogram?

How to make a histogram?

What is a line plot?

How do you find the mean of a data set?

How do you find the median of a data set?

How do you find the standard deviation of a data set?

What is the interquartile range?

What is the mean of a data set?

What is the median of a data set?

What is normal distribution?

What is bivariate data?

How to write and use a prediction equation

What does the slope of a line mean?

What is "rate of change"?

How to find the rate of change from two points on a graph?

How to use a graph of a linear equation to solve a word problem?

What is positive correlation?

What is negative correlation?

What does it mean to have no correlation?

What is an unbiased sample?

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
Measures of Center and Standard Deviation 4 – 6 days	SWBAT calculate the mean, median, mode, and identify the outlier and the standard deviation then use the standard deviation to analyze the disbursement of the data set.	Review the definition of mean Big Ideas Math Algebra 1 Exploration 11.1	Observation Use of technology to support instruction	HS.S.ID.A.3

		Guided Notes Vocabulary review: Mean, median, mode, range, outlier New Vocabulary: Standard deviation Explain steps to calculate standard deviation Model creating a table to help calculate standard deviation	Classwork Homework Application of real-life problems	
Box and Whisker Plots 2 – 3 days	SWBAT represent, interpret, and compare data on a real number line by creating and using a Box and Whisker plot	Big Ideas Math Algebra 1 Exploration 11.2 Guided Notes Vocabulary: Quartile, median, skewed, symmetric Students may represent geoscience data, with plots on the real number line, as they analyze results from global climate models.	Observation Use of technology to support instruction Classwork Homework Application of real-life problems	HS.S.ID.A.1 HS.S.ID.A.3
Shapes of	SWBAT describe the shape of data	Big Ideas Math Algebra 1 Exploration	Observation	HS.S.ID.A.1

Distribution 2 – 3 days	distribution, choose the appropriate measures and compare data distributions	11.3 Guided Notes Vocabulary: histogram, frequency table Review the properties of a histogram and how to make one using Google Sheets or MS Excel Compare/Contrast a histogram to box and whisker plot Analyze data to determine if the data is skewed or symmetrical Compare data in two data sets to interpret the data into words Students may represent geoscience data, with plots on the real number line, as they analyze results from global climate models.	Use of technology to support instruction Classwork Homework Application of real-life problems	HS.S.ID.A.2 HS.S.ID.A.3
Formal assessment 2 days	SWBAT calculate mean, median, mode, and standard deviation	Practice assessment and formal assessment. Students can use Sheets or Excel to represent	Observation Formal assessment	HS.S.ID.A.1 HS.S.ID.A.2 HS.S.ID.A.3

	SWBAT create a box and whisker plot and a histogram then analyze the data represented	their data		
Two-way tables 2 – 3 days	SWBAT create and interpret data in a two-way table SWBAT recognize associations in data	Big Ideas Math Algebra 1 Exploration 11.4 Exploration 1 Guided notes Vocabulary: two-way table, joint frequency, marginal frequency, and joint, marginal, and conditional relative frequency How to find relative frequencies How to recognize associations in the data	Observation Use of technology to support instruction Classwork Homework Application of real-life problems	HS.S.ID.B.5
Choosing a data display 3 – 4 days	SWBAT evaluate given data and determine the best way to display (present) that data	Big Ideas Math Algebra 1 Exploration 11.5 Guided notes Vocabulary: qualitative data, quantitative data,	Observation Use of technology to support instruction Classwork	HS.S.ID.A.1

		misleading graph Create a variety of data displays of the same data set (i.e. table of values, box-whisker, pie, histogram, line graph) Students may represent geoscience data on two quantitative variables on a scatter plot and describe how the variables are related in order to analyze the data and the results from global climate models.	Homework Application of real-life problems	
Formal assessment 2 days	SWBAT evaluate and represent data based on the given data set	Practice assessment and formal assessment. Students can use Sheets or Excel to represent their data Students may use linear or exponential functions fitted to geoscience data to solve problems and analyze the results from global climate models to make an evidence-based forecast of the current rate of global climate change.	Observation Formal assessment	HS.S.ID.A.1 HS.S.ID.A.2 HS.S.ID.A.3 HS.S.ID.B.5

MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.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.
MA.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
MA.S-ID.B.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Suggested Modifications for Special Education, ELL and Gifted Students

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Google Sheets or MS Excel

Internet Resources

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