Algebra II & Algebra II Honors

Required

Keansburg High School

5 credits

Full Year

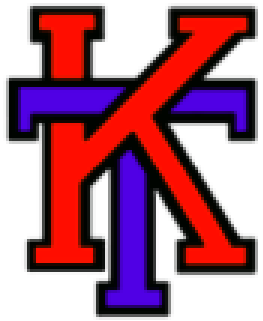

Table of Contents:

Statement of Purpose

Building on the understanding of linear, quadratic and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations.

Summary of the Course

Building on the understanding of linear, quadratic and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations. At the start of the course, standards will focus on the similarities of arithmetic with rational numbers and arithmetic with rational expressions. As the course continues, it will extend student's algebra knowledge of linear and exponential functions to include polynomial, rational, radical, and absolute value functions.The standards build on the students' previous knowledge of functions, trigonometric ratios and circles in geometry to extend trigonometry to model periodic phenomena. Finally, students will explore the effects of transformations on graphs of functions and will include identifying an appropriate model for a given situation. The standards require development of models more complex than those of previous courses. The standards will relate the visual displays and summary statistics learned in prior courses to different types of data and to probability distributions. Samples, surveys, experiments and simulations will be used as methods to collect data.

In order to demonstrate a cohesive and complete implementation plan the following general suggestions are provided:

· The use of various formative assessments are encouraged in order to provide an ongoing method of determining the current level of understanding the students have of the material presented.

· Homework, when assigned, should be relevant and reflective of the current teaching taking place in the classroom.

· Organizational strategies should be in place that allow the students the ability to take the information gained in the classroom and put it in terms that are relevant to them.

· Instruction should be differentiated to allow students the best opportunity to learn.

· Assessments should be varied and assess topics of instruction delivered in class.

· Modifications to the curriculum should be included that address students with Individualized Educational Plans (IEP), English Language Learners (ELL), and those requiring other modifications (504 plans).

Pacing Guide

	Timeframe	**Title of Unit**
1	**28 days**	Unit 1: Functions and Linear Relationships
2	**20 days**	Unit 2: Quadratic Equations & Complex Numbers
3	**13 days**	Unit 3: Quadratic Functions
4	**25 days**	Unit 4: Polynomial Functions
5	**24 days**	Unit 5: Rational Exponents & Radical Equations
6	**20 days**	Unit 6: Rational Expressions, Equations, & Functions
7	**23 days**	Unit 7: Exponential & Logarithmic Functions
8	**10 days**	Unit 8: Trigonometric Functions
9	**8 days**	Unit 9: Statistics

Unit 1: Linear Relations and Functions

Summary of the Unit: This chapter presents topics that were studied in Algebra 1. Transformations of linear, quadratic, and absolute value functions are explored. The parent functions are established and then transformed functions are compared to the parent. Rigid transformations include vertical and horizontal translations and reflections. Nonrigid transformations are vertical and horizontal stretches and shrinks. Students will review modeling with linear functions in the third section. This involves writing linear functions from given information and fitting a line to data. Results from performing a linear regression are compared to the model determined by hand. In the last section, students extend prior work with systems of equations to solving linear systems in three variables. Students may well be a bit rusty with their algebra skills. The review content should be familiar to students, with new content introduced at an appropriate level. It is assumed that students will be using graphing technology in this book. In this first chapter, many fundamental calculator skills are integrated in the lessons

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, midterm, final.

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Functions	5 days	-Students will identify functions given a graph, table , or set of ordered pairs. Students will state the domain and range of a function given a graph, equation, or set of ordered pairs.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. HSF-IF.B.5
2.Function Families	6 Days	-Students will identify families of functions. -Students will describe transformations of parent functions. -Students will describe combinations of transformations.		HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
3. Function Notation and Evaluating Functions	4 Days	Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.		HSF-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
4. Slope, parallel/perpendicular lines	4 days	-Students will write equations of linear functions using points and slopes.		HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HSF-IF.C.9

				HSF-BF.A.1a Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context.
5. Modeling With Linear Functions	5 days	-Students will write equations of linear functions using points and slopes. -Students will find lines of fit and lines of best fit.		HSF-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). HSS-ID.B.6a
6. Absolute Value Functions	4 days	-Students will identify absolute value functions-Students will describe transformations of absolute value functions. -Students will describe combinations of transformations of absolute value functions - Students will be able to graph absolute value functions		HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. HSF-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. HSF-IF.C.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. HSF-IF.C.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Suggested Modifications for Special Education, 504, English Language Learners, RTI and Gifted Students:

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops

- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

Climate Change: 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.

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.

9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 2: Quadratic Equations & Complex Numbers

Summary of the Unit: This unit focuses on the structural similarities between quadratic systems and the integers. Students will learn to identify the zeros of quadratic functions, including complex zeros, and connect these zeros to the solutions of quadratic equations. The content includes a review of methods for factoring quadratic polynomials, as well as techniques for solving and graphing quadratic functions and equations.
Additionally, students will explore quadratic inequalities and their applications. The unit emphasizes working within the complex number system, where students will practice simplifying expressions that include complex numbers. Overall, the unit aims to deepen students' understanding of quadratics and their real world applications.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, midterm, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Solving Quadratic Equations: Factoring, Square Roots & Complete the Square	5 days	-Students will solve quadratic equations by factoring. -Students will solve quadratic equations algebraically with square roots and completing the square.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator. F.IF.C.7e	HSN-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. HSA-REI.B.4b Solve quadratic equations by inspection (e.g., for), 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 for real numbers HSA-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. HSA-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.
2. Solving equations that are reducible to quadratic form	4 days	-Students will solve quadratic equations using the Quadratic Formula. -Students will analyze the discriminant to determine the number and type of solutions. -Students will solve real-life problems.		HSN-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. HSA-REI.B.4b Solve quadratic equations by inspection (e.g., for), 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 for real numbers and .

3. Application of Quadratics	4 days	-Students will solve real-life problems. -Students will be able to apply the techniques for finding zeros of a quadratic to real-world problems.		HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. HSA-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. HSA-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.
4. Imaginary and Complex Numbers	4 days	-Students will be able to simplify square roots that have imaginary solutions. - Students will be able to perform operations with imaginary and complex numbers.		HSN-CN.A.1 Know there is a complex number i such that and every complex number has the form with and real. HSN-CN.A.2 Use the relation and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. HSN-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. HSA-REI.B.4b Solve quadratic equations by inspection (e.g., for), 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 for real numbers and .
5. Solve Quadratics with Complex Solutions	3 days	-Students will explore properties of parabolas. -Students will find maximum and minimum values of quadratic functions. -Students will graph quadratic functions using x-intercepts. -Students will solve real-life problems.		HSA-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. HSA-REI.B.4b Solve quadratic equations by inspection (e.g., for), 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 for real numbers and . HSF-IF.C.8a Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.

8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 3: Quadratic Functions

Summary of the Unit: Background information of quadratic functions should include factoring quadratic expressions, graphing quadratic equations written in three forms, and solving quadratic equations using a variety of approaches. In the previous chapter, students looked at the transformations of linear and absolute value functions. The first lesson in this chapter introduces the same transformations on quadratic functions. The vertex of the absolute value function and the vertex of a quadratic function are key points that help students quickly distinguish the type(s) of transformation(s) displayed in a graph. The second and third lessons look at characteristics of quadratic functions. Where is the function increasing or decreasing? Where is the line of symmetry? What is the maximum/ minimum value of the function? How can the quadratic be defined by a fixed point (focus) and a fixed line (directrix)? The last lesson of the chapter looks at modeling with quadratic functions. The technique of solving systems from Chapter 1 is extended to a 3-by-3 system. Students also use regression analysis on a calculator. There are four common forms in which quadratics are written, and each gives information about the graph and the behavior of the function. Understanding the connection between the characteristics of a quadratic and its equation can help students apply their knowledge when working with a real-life application.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, midterm, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section

1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Graphing Quadratic Functions	6 days	-Students will explore properties of parabolas. -Students will find maximum and minimum values of quadratic functions. -Students will graph quadratic functions using x-intercepts. -Students will solve real-life problems.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSF-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. HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). HSA-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.
2. Transformations and Translations	4 days	-Students will describe transformations of quadratic functions. -Students will write transformations of quadratic functions -Students will be able to recognize piecewise functions, graph them, and correctly evaluate them at given points.		HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases

				and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
3. Average Rate of Change and Modeling with Quadratic Functions	3 days	-Students will be able to calculate the average rate at which things change. - Students will be able to write quadratic functions to model real-world problems. - Students will be able to determine when two functions are equivalent.		HSF-IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. HSF-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.

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Suggested Modifications for Special Education, 504, English Language Learners, RTI and Gifted Students:

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 4: Polynomial Functions

Summary of the Unit: Linear and quadratic functions are two types of polynomials, so connections to earlier work are easily made. In the first lesson, polynomial functions are defined and graphed. Operations on polynomial expressions are presented so that polynomial expressions can be factored. Prior work with factoring is extended to third- and fourth-degree expressions. Synthetic division is used to efficiently check for possible rational roots when rewriting polynomials in factored form in order to solve polynomial equations. All of the work with operations on polynomials, factoring, and solving leads to the Fundamental Theorem of Algebra in the middle of the chapter: If f(x) is a polynomial of degree n, where n > 0, then the equation f(x) = 0 has at least one solution in the set of complex numbers. The corollary to the theorem, namely that an nth-degree polynomial function has exactly n zeros, is the focus of the lesson. • The last third of the chapter deals with polynomial functions, in particular the graphs of these functions. Earlier work with transformations is applied to polynomials. Concepts that are foundational for work in calculus are presented, and finally polynomials are used to model real-life data. Earlier work with finite differences and regression is used.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, midterm, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Intro to Polynomial Functions	1 day	-Students will identify polynomial functions. -Students will graph polynomial functions using tables and end behavior.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSF-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. HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
2. Addition, Subtraction, and Multiplication of Polynomials	1 day	-Students will add and subtract polynomials. -Students will multiply polynomials. -Students will use Pascal's Triangle to expand binomials.		HSA-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. HSA-APR.C.4 (+)Prove polynomial identities and use them to describe numerical relationships. HSA-APR.C.5(+)Know and apply the Binomial Theorem for the expansion of in powers of and for a positive integer , where and are any numbers, with coefficients determined for example by Pascal's Triangle.
3. Dividing Polynomials	3 days	-Students will use long division to divide polynomials by other polynomials.		HSA-APR.B.2 Know and apply the Remainder Theorem: For a polynomial and a number , the remainder on division by is , so if and only if is a factor of .

		-Students will use synthetic division to divide polynomials by binomials of the form x – k. -Students will use the Remainder Theorem.		HSA-APR.D.6 Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the more complicated examples, a computer algebra system.
4. Factoring Polynomials	7 day	-Students will factor polynomials. -Students will use the Factor Theorem		HSA-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. HSA-APR.B.2 Know and apply the Remainder Theorem: For a polynomial and a number , the remainder on division by is , so if and only if is a factor of . HSA-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.
5. Solve Equations by Factoring	3 days	-Students will find solutions of polynomial equations and zeros of polynomial functions. -Students will use the Rational Root Theorem. -Students will use the Irrational Conjugates Theorem		HSA-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.
3. Solving Polynomial Equations	2 days	-Students will find solutions of polynomial equations and zeros of polynomial functions. -Students will use the Rational Root Theorem. -Students will use the Irrational Conjugates Theorem		HSA-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.
7. The fundamental Theorem of Algebra	1 days	-Students will use the Fundamental Theorem of Algebra. -Students will find conjugate pairs of complex zeros of polynomial functions.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology	HSN-CN.C.8 (+) Extend polynomial identities to the complex numbers. HSN-CN.C.9 (+) Know the Fundamental Theorem of Algebra;

		-Students will use Descartes Rules of Signs.	5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	show that it is true for quadratic polynomials. HSA-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.
8. Graphing Polynomial Function	3 days	-Students will identify polynomial functions. -Students will graph polynomial functions using tables and end behavior.		HSF-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. HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
9. Transformations of polynomial functions	2 day	-Students will describe transformations of polynomial functions. -Students will write transformations of polynomial functions.		HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
10. Analyzing Graphs of Polynomial Functions	1 day	-Students will use x-intercepts to graph polynomial functions. -Students will use the Location Principle to identify zeros of polynomial functions. -Students will		HSA-APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph

		find turning points and identify local maximums and local minimums of graphs of polynomial functions. -Students will identify even and odd functions.		of the function defined by the polynomial. HSF-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. HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
11. Modeling with Polynomial Functions	2 day	-Students will write polynomial functions for sets of points. -Students will write polynomial functions using finite differences. -Students will use technology to find models for data sets.		HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HSF-BF.A.1a Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:

*Consistent with individual plans, when appropriate.

Suggested Modifications for Special Education, 504, English Language Learners, RTI and Gifted Students:

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com

- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.

9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 5:Rational Exponents & Radical Equations

Summary of the Unit: This unit covers operations with radical functions and radical exponents. The unit begins with simplifying square roots and irrational roots. Students are then exposed to adding, subtracting, and multiplying radicals. The next part of this chapter introduces radicals and nth roots and how these may be written as rational exponents. A connection is made to the properties of exponents studied in Algebra 1, noting that now exponents can be rational numbers and are no longer restricted to being nonzero integers. In the middle portion of the chapter, radical expressions, also written in rational exponent form, are represented as functions and are graphed. This leads to a look at what the domains are for each function type. The graphs of radical functions are used to help students think about solutions of radical equations and inequalities. Certainly, one goal is for students to recognize that solving radical equations is an extension of solving other types of functions. The difference, however, is that sometimes extraneous solutions are introduced when solving radical equations, so it is necessary to check apparent solutions. The last lessons in the chapter involve performing the four basic operations on functions and doing so from multiple approaches: symbolic, numerical, and graphical.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, midterm, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Simplifying square roots and irrational roots	3 Days	-Students will be able to simplify radicals and radical expressions. -Students will be able to simplify complex radical expressions using i.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HRN.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. HRN.RN.A.3 Simplify radicals, including algebraic radicals
2. Adding, Subtracting, multiplying radicals, and rationalizing the denominator	5 Days	-Students will be able to add, subtract, and multiply radicals. - Students will be able to simplify complex radical expressions using i.		HRN.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. HRN.RN.A.3 Simplify radicals, including algebraic radicals
3. Cube Roots and Nth Roots	4 Days	-Students will be able to simplify radicals with an index other than 2.		HRN.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. HRN.RN.A.3 Simplify radicals, including algebraic radicals
4. Rational Exponents	3 Days	-Students will be able to convert rational exponents to and from radical form.		HSN-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

5. Solving Radical Equations	5 Days	-Students will be able to solve radical equations and identify extraneous answers.		HSA-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. HSA-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
6. Graphing Square Root Functions	4 Days	-Students will be able to graph square roots and describe the transformation of the parent function.		HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude.

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:
Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.

8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 6: Rational Expressions, Equations, & Functions

Summary of the Unit: The unit begins with how to solve variation problems inversely and jointly. The unit then focuses on simplifying, adding, subtracting, multiplying, and dividing rational expressions. Students will be asked to solve rational equations and identify extraneous solutions if they exist. The unit then transitions to graphing reciprocal functions and their transformations. Finally, the unit concludes with graphing rational functions. The students will be introduced to asymptotes and removable discontinuities. This introduction to domain restrictions will prepare them for Pre-Calculus, as well as show various real-world situations, where not all parts of the domain are feasible.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Joint and Inverse Variation	2 days	Students will be able to solve variation problems inversely and jointly.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSA-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HSA-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.
2. Simplifying Rational Expressions	5 Days	Students will be able to simplify rational expressions.		HSA-APR.D.6 Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the more complicated examples, a computer algebra system.
3. Operations with Rational Expressions	5 Days	Students will be able to add, subtract, multiply, and divide rational expressions.		HSA-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the

				maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. HSA-APR.D.6 Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the more complicated examples, a computer algebra system.
4. Solving Rational Equations	4 Days	Students will be able to solve rational equations and identify solutions as feasible or extraneous.		HSA-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
5. Graphing Rational Functions	6 Days	-Students will be able to graph reciprocal functions and describe transformations of key features; intercepts, asymptotes, etc. - Students will be able to graph rational functions and identify key features; asymptotes, removable discontinuities, etc.		HSF-IF.B.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. HSF-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. HSF-IF.B.5 HSF-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.d HSA-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.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest

9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 7: Exponential & Logarithmic Functions

Summary of the Unit: This unit presents two new types of functions, exponential and logarithmic. Students should have some prior experience with exponential functions from Algebra 1, particularly with growth and decay models. The natural base e, an irrational number, is introduced in the second lesson. Students write and graph exponential functions for base e and other bases. Compound interest and continuous compounding are two of the many applications explored. The logarithmic function, which is the inverse of the exponential function, is introduced, and the connection to properties of exponents is made. In addition, transformations of the graphs of both functions are presented in the middle of the unit. The last part of the unit looks at solving exponential and logarithmic equations using different approaches: analytical, numerical, and graphical. The unit ends with a lesson on mathematical modeling. Given a set of data, an exponential or logarithmic equation is fit to the data.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Exponential Growth and Decay Functions	4 Days	-Students will graph exponential growth and decay function, showing intercepts and end behaviors. -Students will use exponential models to solve real-life problems.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSA-SSE.B.3c Use the properties of exponents to transform expressions for exponential functions. HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude. HSF-IF.C.8b Use the properties of exponents to interpret expressions for exponential functions. HSF-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). HSF-LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.
2. The Natural Base e	2 days	-Students will define and use the natural base e. -Students will graph natural base functions. -Students will solve real-life problems.		HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude. HSF-LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.
3. Logarithms and Logarithmic Functions	4 days	-Students will define and evaluate logarithms. -Students will use inverse properties of logarithmic and exponential functions. -Students will graph logarithmic functions.		HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude. HSF-BF.B.4a Solve an equation of the form for a simple function f that has an inverse and write an expression for the inverse. For example, or for .

				HSF-LE.A.4 Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to where , , and are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
4. Transformations of Exponential and Logarithmic Functions	3 days	-Students will transform graphs of exponential functions. -Students will transform graphs of logarithmic functions. -Students will write transformations of graphs of exponential and logarithmic functions.		HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude. HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
5. Properties of Logarithms	5 days	- Students will use the properties of logarithms to evaluate logarithms. -Students will use the properties of logarithms to expand or condense logarithmic expressions. -Students will use the change-of-base formula to evaluate logarithms.		HSA-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. HSF-LE.A.4 Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to where , , and are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
6. Solving Exponential and Logarithmic Equations	5 days	-Students will solve exponential equations. -Students will solve logarithmic equations. -Students will solve exponential and logarithmic inequalities.		HSA-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. HSF-LE.A.4 Understand the inverse relationship between exponents and

				logarithms. For exponential models, express as a logarithm the solution to where , , and are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print

and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 8: Trigonometric Functions

Summary of the Unit: This unit quickly reviews concepts about right triangle trigonometry that students learned in geometry. Students are introduced to radian measure, and the six trigonometric functions are defined in terms of a unit circle. The next two lessons focus on graphing the six trigonometric functions. The graphs of sine and cosine are developed by plotting functional values for benchmark angles, and the concept of periodic functions is introduced. The graphs of the remaining four trigonometric functions are deduced from knowing the relationship between these functions and sine and cosine. Knowledge of transformations is used to plot graphs beyond the parent functions. The last two lessons of the unit introduce students to trigonometric identities and sum and difference formulas.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Trigonometric functions and Triangles	2 days	-Students will evaluate trigonometric functions of acute angles. -Students will find unknown side lengths and angle measures of right triangles. -Students will use trigonometric functions to solve real-life problems.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSF-TF.A.1 (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. HSF-TF.A.2 (+) Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. HSF-TF.B.5 (+) Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. HSF-TF.C.8(+) Prove the Pythagorean identity and use it to find , or given , or and the quadrant of the angle.
2. Radians, Cofunctions, and Problem Solving	2 days	-Students will draw angles in standard position. -Students will find coterminal angles. -Students will use radian measures. -Students will evaluate trigonometric functions of any angle. -Students will find and use reference angles to evaluate trigonometric functions.		HSF-TF.A.1 (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. HSF-TF.A.2 (+) Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
3. Graph of Trigonometric Functions	2 days	-Students will explore characteristics of sine and cosine functions.		HSF.IF.C.7f (+) Graph trigonometric functions, showing period, midline, and amplitude.

		-Students will stretch and shrink graphs of sine and cosine functions. -Students will translate graphs of sine and cosine functions. -Students will reflect graphs of sine and cosine functions. -Students will explore characteristics of tangent and cotangent functions. -Students will graph tangent and cotangent functions -Students will graph secant and cosecant functions.		HSF-BF.B.3 Identify the effect on the graph of replacing by , , , and for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
4. Trigonometric Function Relationships	2 days	-Students will use trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions. -Students will verify trigonometric identities -Students will use sum and difference formulas to evaluate and simplify trigonometric expressions. -Students will use sum and difference formulas to solve trigonometric equations and rewrite real-life formulas.		HSF-TF.C.8 (+) Prove the Pythagorean identity and use it to find , or given , or and the quadrant of the angle. HSF-TF.C.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
6. Right Triangle and Problem Solving	2 days	-Students will interpret and use frequency. -Students will write trigonometric functions. Students will use technology to find trigonometric models.		HSF-TF.B.5 (+) Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. HSF-BF.A.1a Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context. HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:

*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:
SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**
SL.PE.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **(Classwork)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest

9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Unit 9: Statistics

Summary of the Unit: This last unit on data analysis and statistics builds upon the content in the previous units. The overarching goal is to develop strategies for analyzing data that are collected from the result of an experiment or survey. In the first lesson, the normal distribution is defined and its properties are described. Students will learn to calculate z-scores and find the associated probabilities from a standard normal table. The next three lessons look at how populations can be sampled and data collected without introducing bias. Random samples are defined. Students are introduced to experiments and observational studies, and they analyze experimental designs. Correlation and causation are discussed. The last two lessons of the unit look at making inferences from sample surveys as well as from experiments. Many of the topics in this unit are covered more deeply in a full statistics course. The hope is that all students will become more analytic as they read or hear accounts of research studies or claims made by businesses and organizations.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:
Summative Assessments
Alternative Assessments
Formative Assessments

Linkit Benchmark
Project, unit test, final

Student proficiency (for a specific unit or multiple units) is defined for the individual at 80% or better; for the class: 80% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section
1. Quizzes
2. Tests
3. Homework
4. Classwork
5. Exit Slips
5. Projects (optional)
6. Labs (optional)

Instructional Materials: Big Ideas Math Algebra 2 Textbook (Bigideasmath.com), graph paper, graphing calculator, internet resources, whiteboards, and additional manipulatives based on activity

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
1. Using normal distributions	2 days	-Students will calculate probabilities using normal distributions. -Students will use z-scores and the standard normal table to find probabilities. -Students will recognize data sets that are normal.	1. Problem Based Learning 2. Guided Practice Problems 3. Cooperative Groups 4. Technology 5. PowerPoint Presentations 6. Participation & Discussion 7. Homework 8. Project 9. Think/pair/share 10. Other **Honors Extension:** In preparation for PreCalculus, all honors students will be required to express the topic verbally, numerically, graphically, and algebraically. All four of these requirements must be met with and without the assistance of a graphing calculator.	HSS-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
2. Populations, Samples, and Hypotheses	1 day	-Students will distinguish between populations and samples. -Students will analyze hypotheses.		HSS-IC.A.2(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.A.1(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
3. Collecting Data	1 day	-Students will identify types of sampling methods in statistical studies. -Students will recognize bias in sampling. -Students will analyze methods of collecting data. -Students will recognize bias in survey questions		HSS-IC.A.1(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.B.3(+) Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
4. Experimental Design	2 days	-Students will describe experiments. -Students will recognize how randomization applies to experiments and observational studies. -Students will analyze experimental designs.		HSS-IC.A.1(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.B.3(+) Use data from a randomized experiment to compare two treatments; use simulations to

				decide if differences between parameters are significant. HSS-IC.B.6(+) Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
5. Making Inferences from Sample Surveys	1 day	-Students will estimate population parameters. -Students will analyze estimated population parameters. -Students will find margins of error for surveys		HSS-IC.A.2(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.B.4(+) Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
6. Making Inferences from Experiments	1 day	-Students will estimate population parameters. -Students will analyze estimated population parameters. -Students will find margins of error for surveys.		HSS-IC.A.2(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.B.5(+) Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, English Language Learners, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to

support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

Students will utilize the following devices, subscriptions and websites to meet these standards.

- Laptops
- Bigideasmath.com
- Desmos.com
- Google Classroom
- McGraw Hill ALEKS

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2: Redesign an existing product to improve form or function.

Interdisciplinary Connections, 21st Century Connections & Career Ready Practices:

SL.UM.11-12.5 - Make strategic use of digital media (e.g. textual graphical audio visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence and to add interest. **(Classwork, Homework, Assessments)**

2020 New Jersey Student Learning Standards – Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest
9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
9.2.12.CAP.13: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.
9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).