Kenilworth Public Schools

Curriculum Guide

Content Area: Algebra II
Grade: 11
BOE Approved: 8/13/2012

Revision Date: June 2022
Submitted by: Mendy Petti
BOE Revision Approved: 8/8/22

Algebra II and II Honors/Trig- Scope and Sequence

Unit 1- Quadratic Functions & Factoring (Chapter 1, plus extension for Abs Value after vertex form)	Unit 2- Polynomials and Polynomial Functions (Chapter 2)	Unit 3- Rational Functions (Chapter 5)	Unit 4- Rational Exponents and Radical Functions (plus piecewise functions with supp. material) (Chapter 3)	Unit 5- Exponential and Logarithmic Functions (Chapter 4)	Unit 6- Sequences and Series, Data Analysis, Right Triangle Trig. (Sections 7.1-7.4, 6.3, 9.1)	Unit 7- Trigonometry (Sections 9.2-9.6, 10.1, 10.3-10.7)
Weeks 1-8	Weeks 9-15	Weeks 16-19	Weeks 20-23	Weeks 24-27	Weeks 28-34	(6 weeks needed, reducing Units 1-6 by 1 week each)
Unit Description: Graph, analyze, model, and solve quadratic functions. (Chapter 1)	*Unit Description:* Use properties of exponents. Graph, analyze, model, and solve polynomial functions. (Chapter 2)	*Unit Description:* Graph, analyze, model and solve rational functions. (Chapter 5)	*Unit Description:* Understand and use rational exponents. Analyze and graph radical functions. Graph piecewise functions. Solve radical equations. (Chapter 3)	*Unit Description:* Graph, analyze, model, and solve exponential and logarithmic functions. (Chapter 4)	*Unit Description:* Define, analyze, and find sums of sequences and series. Apply the fundamentals of data analysis and probability distributions. Apply basic Right Triangle Trigonometry. (Sections 7.1-7.4, 6.3, 9.1)	*Unit Description:* Understand and apply Trigonometric properties and identities. Graph trig functions. (Additional unit for Alg. 2/Trig and Hon. Alg. 2 course) (Sections 9.2-9.6, 10.1, 10.3-10.7)

Unit Targets: • Graph quadratic functions in standard form. • Graph quadratic functions in vertex or intercept form. • (extension) Graph absolute value functions ** and transformations. • Solve $x^2+bx+c=0$ by factoring. • Solve $ax^2+bx+c=0$ by factoring. • Solve quadratic equations by find square roots. • Perform operations with complex numbers. • Solve quadratics by completing the square. • Use the Quad. Formula and the discriminant. • Graph and solve quadratic inequalities. ** Use supplemental resources for absolute value functions.	*Unit Targets:* • Use Properties of Exponents. • Evaluate and graph polynomial functions. • Add, subtract, and multiply polynomials. • Factor and solve polynomial equations. • Apply the remainder and factor theorems. • Find rational zeros. • Apply the fundamental theorem of algebra. • Analyze graphs of polynomial functions.	*Unit Targets:* • Model inverse and joint variation. • Graph simple rational functions. • Graph general rational functions. • Multiply and divide rational expressions. • Add and subtract rational expressions. • Solve rational equations. • Describe and compare function characteristics.	*Unit Targets:* • Evaluate *n*th roots and use rational exponents. • Apply properties of rational exponents. • Perform function operations and composition. • Use inverse functions. • Graph square root and cube root functions. • Graph piecewise functions ** • Solve radical equations. ** Use supplemental resources for piecewise functions.	*Unit Targets:* • Graph exponential growth functions. • Graph exponential decay functions. • Use functions involving *e.* • Evaluate logarithms and graph logarithmic functions. • Apply properties of logarithms. • Solve exponential and logarithmic equations. • Create and apply exponential and power functions.	*Unit Targets:* • Define and use sequences and series. • Analyze arithmetic sequences and series. • Analyze geometric sequences and series. • Evaluate sums of infinite geometric series. • Analyze variation. • Construct and interpret normal distributions.	*Unit Targets:* • Use Trigonometry with right triangles. • Define the Unit Circle, and general angles and use radian measure. • Derive the Unit Circle using right triangle Trig.** • Evaluate Trig functions of any angle. • Evaluate inverse Trig functions. • Apply the Laws of Sines and Cosines. • Graph, translate and reflect Trig functions. • Verify Trig identities. • Solve Trig equations. • Write Trig functions and models. • Apply sum and difference formulas. • Apply multiple-

						angle formulas. ** Use supplemental resources for Unit Circle.

Algebra II and II Honors/Trig- Unit 1

Unit title: Quadratic Functions and Factoring (Chapter 1)

Unit summary: Graph, analyze, model and solve quadratic functions.

Primary interdisciplinary connections: Science, Social Studies, Economics, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.F.IF.7a, 9-12.A.SSE.3a, 9-12.A.REI.4b, 9-12.N.CN.2, 9-12.A.REI.4a, 9-12.N.CN.7, CC.9-12.F.IF.7a, CC.9-12.A.SSE.3a, CC.9-12.A.REI.4b, CC.9-12.N.CN.2, CC.9-12.A.REI.4a, CC.9-12.N.CN.7

Content Statements:

1	Quadratic functions in standard form
2	Quadratic functions in vertex or intercept form
3	(extension on lesson of vertex form of quadratics) Absolute Value functions and transformations
4	Factoring $x^2+bx+c=0$
5	Factoring $ax^2+bx+c=0$
6	Square roots of Quadratic Equations
7	Complex numbers
8	Completing the square
9	The Quadratic Formula and the discriminant
10	Quadratic Inequalities

Big Idea: Many real-life situations can be modeled using quadratic functions.

Unit Essential Questions:

- What is the shape and characteristics of the graph of a quadratic function?
- What real-world situations can be modeled by quadratics?
- How can quadratic functions be solved and how many solutions can exist?

Unit Enduring Understandings:

- Quadratic functions are in the shape of a parabola.
- There are as many as two solutions for a quadratic function and a variety of techniques for finding them.

Unit Learning Targets

Students will…

- Graph quadratic functions in standard form.
- Graph quadratic functions in vertex or intercept form.

- Solve $x^2+bx+c=0$ by factoring.
- Solve $ax^2+bx+c=0$ by factoring.
- Solve quadratic equations by find square roots.
- Perform Operations with complex numbers.
- Solve Quadratics by completing the square.
- Use the Quadratic Formula and the discriminant.
- Graph and Solve Quadratic Inequalities.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Graph the parent function for quadratic functions, identify the characteristics of the graph, and explore the effects of changing the coefficients of quadratic functions in standard form. 1. Graph the parent function. 2. Identify the vertex and axis of symmetry. 3. Explore the effect of changing the coefficient "a" to values greater than and less than one and to positive and negative values. 4. Explore the effect of adding a "c" coefficient and changing its value. 5. Explore the effect of adding a "b" coefficient and changing its value. 6. Recognize that "c" is the y-intercept and discuss the formula for the x-coordinate of the vertex.	20 minutes
• Model dropped objects with the quadratic function. 1. Given the model function, calculate times for objects to fall to earth from various heights. Discuss the relationship between the height and the time to drop to the earth. Demonstrate with actual objects. Discuss that mass does not affect the time to drop (assuming negligible air resistance).	30 minutes

2. Extend the discussion to include the path of all objects in flight, such as that of a batted baseball. Discuss the independence of horizontal and vertical motion. 3. Find maximum heights of objects in flight. Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension	Weeks 1-8

• Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Whiteboard, SMART board, Projector or Blackboard • Graphing software projected on a large screen • Actual objects of various weights to drop as demonstrations • Algebra II, HMH, 2012 edition	If all students are provided graphing calculators, add an individual practice exercise to the first activity.

Algebra II and II Honors/Trig- Unit 2

Unit title: Polynomials and Polynomial Functions (Chapter 2)

Unit summary: Use properties of exponents. Graph, analyze, model, and solve polynomial functions.

Primary interdisciplinary connections: Science, Social Studies, Economics, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.N.RN.1, 9-12.F.IF.7c, 9-12. A.APR.1, 9-12.A.SSE.2, 9-12.A.APR.2, 9-12.N.CN.9, CC.9-12.N.RN.1, CC.9-12.F.IF.7c, CC.9-12. A.APR.1, CC.9-12.A.SSE.2, CC.9-12.A.APR.2, CC.9-12.N.CN.9

Content Statements:

1	Properties of exponents
2	Polynomial functions
3	Add, subtract, and multiply polynomials
4	Polynomial equations
5	Remainder and factor theorems
6	Rational zeros
7	Fundamental theorem of algebra
8	Polynomial functions

Big Idea: Perform operations on polynomial expressions and graph polynomial functions.

Unit Essential Questions:

- How are addition, subtraction, multiplication, and division applied to polynomials?
- How are polynomials factored?
- What are the shapes and characteristics of the graphs of polynomial functions?

Unit Enduring Understandings:

- Operations can be performed on polynomials.
- Polynomials can be factored using a variety of techniques.
- The number of solutions of polynomial functions is at most the degree.
- The domain is the set of all real numbers and the functions are continuous.

Unit Learning Targets

Students will…

- Use properties of exponents.
- Evaluate and graph polynomial functions.
- Add, subtract, and multiply polynomials.
- Factor and solve polynomial equations.

- Apply the remainder and factor theorems.
- Find rational zeros.
- Apply the fundamental theorem of algebra.
- Analyze graphs of polynomial functions.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Model volumes of geometric shapes with polynomial functions: Given a rectangle, cylinder, and pyramid, each with dimensions that include variables, find the associated volumes. Include binomials as needed (see pages 92 and 108).	20 minutes
• Explore the graphs of polynomial functions: 1. Graph a cubic function with a positive leading coefficient and a cubic function with a negative leading coefficient, on the same coordinate plane. Note the characteristics of the graphs. (see page 98 example #5 for possible functions to use) 2. Graph a quartic function with a positive leading coefficient and a quartic function with a negative leading coefficient, on the same coordinate plane. Note the characteristics of the graphs (see page 98 example #5 for possible functions to use). 3. Summarize the observations. Make conclusions about end behavior (see page 97).	25 minutes
Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that	Weeks 9-15

instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	

Teacher Resources	*Teacher Note*
• Graphing software projected onto a large screen • Algebra II, HMH, 2012 edition	If all students have access to graphing calculators, students may make individual graphs, and make the same observations.

Algebra II and II Honors/Trig- Unit 3

Unit title: Rational Functions (Chapter 5)

Unit summary: Graph, analyze, model and solve rational functions.

Primary interdisciplinary connections: Science, Social Studies, Economics, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.A.CED.2, 9-12.F.IF.7d, 9-12.A.APR.7, 9-12.A.REI.2, 9-12.F.IF.9
CC.9-12.A.CED.2, CC.9-12.F.IF.7d, CC.9-12.A.APR.7, CC.9-12.A.REI.2, CC.9-12.F.IF.9

Content Statements:

1	Inverse and joint variation
2	Simple rational functions
3	General rational functions
4	Multiply and divide rational expressions
5	Add and subtract rational expressions
6	Rational equations
7	Characteristics of function

Big Idea: Functions with variables in the denominator are defined as rational and can be used to model real-life situations.

Unit Essential Questions:

- What are possible characteristics of the graphs of rational functions?
- What happens when the denominator of a rational expression/function becomes zero?
- How do we solve rational equations?

Unit Enduring Understandings:

- The domain of rational functions may not be the set of all real numbers.
- The graphs of rational functions may contain holes and/or asymptotes.
- There are various ways to solve rational equations.

Unit Learning Targets
Students will…

- Model inverse and joint variation.
- Graph simple rational functions.
- Graph general rational functions.
- Multiply and divide rational expressions.
- Add and subtract rational expressions.
- Solve rational equations.
- Describe and compare function characteristics.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Given that two variables vary inversely, and given one pair of values that satisfy the relationship, write an equation for the function. Repeat this for several different inverse variation functions. Notice a pattern in this process.	20 minutes
• Given one inverse variation function, one rational function that has a hole in the graph, one rational function that has a single vertical asymptote (not at x=0), and one rational function that has two vertical asymptotes: 1. Discuss values that would not be possible for x. Describe the domain for each function. 2. Display the graphs of each function to illustrate that these values for x indeed cannot exist.	25 minutes
Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts	Weeks 9-15

• Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Graphing software projected onto a large screen • Algebra II, HMH, 2012 edition	If all students have access to graphing calculators, students can graph the functions individually in order make the observations.

Algebra II and II Honors/Trig- Unit 4

Unit title: Rational Exponents and Radical Functions (Chapter 3 & supplemental for Piecewise)

Unit summary: Understand and use rational exponents. Analyze and graph radical functions. Graph Piecewise Functions. Solve radical equations.

Primary interdisciplinary connections: Science, Social Studies, Economics, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.N.RN.1, 9-12.N.RN.2, 9-12.F.BF.1, 9-12.F.BF.4, 9-12.F.IF.7b, 9-12.A.REI.2, CC.9-12.N.RN.1, CC.9-12.N.RN.2, CC.9-12.F.BF.1, CC.9-12.F.BF.4, CC.9-12.F.IF.7b, CC.9-12.A.REI.2

Content Statements:

1	Roots and Rational Exponents
2	Properties of Rational Exponents
3	Function Operations and Composition
4	Inverse Functions
5	Square Root and Cube Root Functions
6	Piecewise Functions
7	Radical Equations

Big Idea: Understand and use rational exponents and graph and solve radical functions.

Unit Essential Questions:

- What are the similarities and differences between rational exponents and radical expressions?
- What are inverse functions and composite functions?
- What are the characteristics of the graphs of square and cube root functions?
- How can radical equations be solved?

Unit Enduring Understandings:

- All radical expressions have an equivalent rational exponent expression.
- Two functions composed in both directions will equal x if and only if the two functions are inverses of each other.
- The graphs of the square and cube root functions have distinct shapes and characteristics.
- Radical equations can be solved by raising each side of the equations to the power of the index.

Unit Learning Targets

Students will…

- Evaluate *n*th roots and use rational exponents.
- Apply properties of rational exponents.
- Perform function operations and composition.

- Use inverse functions.
- Graph square root and cube root functions.
- Graph Piecewise Functions
- Solve radical equations.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Simplify given nth roots where n=2, 3, 4 and 5. List perfect squares, perfect cubes, perfect powers of four, and perfect powers of five. Discuss a general procedure for simplifying roots.	25 minutes
• Graph the parent function for square roots and explore the characteristics of the graph. 1. Graph the parent function for square roots 2. Change the leading coefficient to values that are less than and greater than one. Note the effect on the graph. 3. Change the leading coefficient to a negative value. Note the effect on the graph. 4. Add constants that translate the graph. Note the effect on the graph.	15 minutes
Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students.	Weeks 20-23

Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Graphing software projected onto a large screen • Algebra II, HMH, 2012 edition	If all students have access to graphing calculators, the graphing can be done individually and the same observations can be made.

Algebra II and II Honors/Trig- Unit 5

Unit title: Exponential and Logarithmic Functions (Chapter 4)

Unit summary: Graph, analyze, model, and solve exponential and logarithmic functions.

Primary interdisciplinary connections: Science, Social Studies, Economics, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.F.IF.7e, 9-12.F.BF.5, 9-12.F.LE.4, 9-12.F.LE.2

CC.9-12.F.IF.7e, CC.9-12.F.BF.5, CC.9-12.F.LE.4, CC.9-12.F.LE.2

Content Statements:

1	Exponential growth functions
2	Exponential decay functions
3	Functions involving *e*
4	Evaluate logarithms and graph logarithmic functions
5	Properties of logarithms
6	Exponential and logarithmic equations
7	Exponential and power functions

Big Idea: Exponential functions can be used to model growth and decay and can be solved using logarithms.

Unit Essential Questions:

- What are the characteristics of the graphs of exponential and logarithmic functions?
- What can be modeled using exponential functions?
- How can operations be performed on exponential and logarithmic functions?
- How can exponential and logarithmic functions be solved?

Unit Enduring Understandings:

- The graphs of exponential functions can be used to model growth and decay.
- There are special properties for performing operations on logarithmic and exponential expressions.
- Exponential and logarithmic functions are inverses and can be used to solve each other.

Unit Learning Targets

Students will…

- Graph exponential growth functions.
- Graph exponential decay functions.
- Use functions involving *e.*
- Evaluate logarithms and graph logarithmic functions.
- Apply properties of logarithms.

- Solve exponential and logarithmic equations.
- Create and apply exponential and power functions.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Model a family tree with an exponential growth function. 1. Beginning with oneself, draw a family tree for about four generations. 2. Make a table of values for the number of generations, and the corresponding numbers of ancestors. 3. Explore the pattern. Write a function for the number of ancestors as a function of the generation. Determine the number of ancestors one has going back for a large number of generations.	20 minutes
• Explore the graphs of exponential decay functions. 1. Graph the parent function for exponential decay functions. 2. Change the value and sign of the leading coefficient. Note the effect on the graph. 3. Add constants that translate the graph. Note the effect on the graph.	20 minutes
Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging	Weeks 24-27

learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Graphing software projected onto a large screen	If all students have graphing calculators, the graphs can be made

• Algebra II, HMH, 2012 edition	individually and the same changes and observations can be made.

Algebra II and II Honors/Trig- Unit 6

Unit title: Sequences and Series, Data Analysis, Right Triangle Trig (Sections 7.1-7.4, 6.3, 9.1)

Unit summary: Define, analyze, and find sums of sequences and series. Apply the fundamentals of data analysis and probability distributions. Apply basic Right Triangle Trigonometry.

Primary interdisciplinary connections: Science, Social Studies, Business

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.F.IF.3, 9-12.F.BF.2, 9-12.A.SSE.4, 9-12.A.SSE.3, 9-12.S.ID.4, 9-12.G.SRT.6, CC.9-12.F.IF.3, CC.9-12.F.BF.2, CC.9-12.A.SSE.4, CC.9-12.A.SSE.3, CC.9-12.S.ID.4, CC.9-12.G.SRT.6

Content Statements:

1	Sequences and Series
2	Arithmetic sequences and series
3	Geometric sequences and series
4	Infinite geometric series
5	Variation
6	Normal Distributions

Big Idea: Identifying patterns in sequences and series allows us to create models and make predictions. There are many ways to represent and analyze data via normal distributions. Right triangle trigonometry can be used to calculate missing information about triangle measurements.

Unit Essential Questions:

- What is a sequence or a series?
- What is the difference between arithmetic and geometric sequences/series?
- How does a normal curve model real data?
- How can trigonometry be used to solve triangles representing real-life situations?

Unit Enduring Understandings:

- Infinite sequences can be modeled mathematically.
- Understanding the mathematical model of a sequence allows us to find cumulative totals of a series.
- The normal curve can be applied to model numerous real-world scenarios.
- Right triangle trigonometry can be used to solve a triangle given only two measurements.

Unit Learning Targets

Students will…

- Define and use sequences and series.
- Analyze arithmetic sequences and series.
- Analyze geometric sequences and series.
- Evaluate sums of infinite geometric series.

- Analyze variation.
- Construct and interpret normal distributions.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
• Investigate an infinite geometric series with the activity on page 459. • Calculate the height of tall objects given the angle of inclination to the top of the object from a given distance from the base of the object, using right triangle trigonometry. Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted	30 minutes 40 minutes Weeks 28-34

& Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers • Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Algebra II, HMH, 2012 edition	

Algebra II and II Honors/Trig- Unit 7

Unit title: Trigonometry (additional unit for Alg 2/Trig and Hon. Alg 2/Trig) (Sections 9.2-9.6,10.1, 10.3- 10.7)

Unit summary: Understand and Apply Trigonometric Properties and Identities. Graph Trig Functions.

Primary interdisciplinary connections: Business, Social Studies, Science

21st Century Themes: Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy

Learning Targets

NJSLS Standards: 9-12.F.TF.1, 9-12.F.TF.2, 9-12.F.TF.6, 9-12.G.SRT.11, 9-12.F.IF.7e, 9-12.F.TF.8, 9-12.F.TF.7, 9-12.F.TF.5, 9-12.F.TF.9, CC.9-12.F.TF.1, CC.9-12.F.TF.2, CC.9-12.F.TF.6, CC.9-12.G.SRT.11, CC.9-12.F.IF.7e, CC.9-12.F.TF.8, CC.9-12.F.TF.7, CC.9-12.F.TF.5, CC.9-12.F.TF.9

Content Statements:

1	Right Triangles Trigonometry
2	Unit Circle, and General Angles and Use Radian Measure
3	Derive the unit circle
4	Trigonometric Functions of any angle
5	Inverse Trigonometric Functions
6	Laws of Sines and Cosines
7	Trigonometric Identities
8	Trigonometric Equations
9	Sum and Difference Formulas
10	Multiply-Angle Formulas

Big Idea: Evaluate trigonometric functions of general angles and apply properties of trigonometric functions. Graph trigonometric functions and define the unit circle.

Unit Essential Questions:

- What are general angles?
- How can functions with general angles be evaluated?
- How can operations be performed with trigonometric functions?
- What are the characteristics of the graphs of trigonometric functions?

Unit Enduring Understandings:

- The unit circle can be used to draw and evaluate trigonometric functions of common angles.
- Trigonometric properties and identities are used to perform operations on trigonometric expressions and verify identities.
- The trigonometric functions have oscillating graphs and can be used to model real-world cyclical scenarios.

Unit Learning Targets
Students will…

- Use trigonometry with right triangles.
- Define the Unit Circle and general angles, use radian measure.
- Derive the Unit Circle using right triangle trig.
- Evaluate trig functions of any angle.
- Evaluate inverse trig functions.
- Apply the laws of sines and cosines.
- Graph, translate and reflect trig functions.
- Verify trig identities.
- Solve trig equations.
- Write trig functions and models.
- Apply sum and difference formulas.
- Apply multiple-angle formulas.

Evidence of Learning

Summative Assessment: Quizzes, Tests

Formative Assessments:

- Homework
- Classwork
- Other activities at teacher's discretion

Lesson Plans

Activities	*Timeframe*
● Create a unit circle. 1) Given a graphic organizer of a circle of radius one with standard angles in degrees, record the corresponding radian measures. 2) For each angle, starting at 30 degrees, draw the right triangle using the reference angle, and record the corresponding ordered pair of x and y values at that point on the circle. 3) Repeat step 2 until a pattern is noticed. Complete the ordered pairs for each angle. 4) Explore the sine and cosine values for each angle and note that they are the same as the y and x values of the coordinate pair, respectfully.	40 minutes
● Investigate the graphs of the trigonometric functions. 1) In groups, using the unit circles from the activity above, manually graph the sine, cosine, and	40 minutes

tangent functions (one function per group), from -360 degrees to +360 degrees. 2) Make observations about the domain and range of each graph. 3) Discuss the period of each graph. Discuss the amplitude of the sine and cosine graphs. Students with Disabilities, English Language Learners, and Gifted & Talented Students: Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support Students with Disabilities: • Use of visual and multisensory formats • Use of assisted technology • Use of prompts • Modification of content and student products • Testing accommodations • Authentic assessments Examples of Strategies and Practices that Support Gifted & Talented Students: • Adjusting the pace of lessons • Curriculum compacting • Inquiry-based instruction • Independent study • Higher-order thinking skills • Interest-based content • Student-driven instruction • Real-world problems and scenarios Examples of Strategies and Practices that Support English Language Learners: • Pre-teaching of vocabulary and concepts • Visual learning, including graphic organizers	6 Weeks Needed Reduce Units1-6 by one week

• Use of cognates to increase comprehension • Teacher modeling • Pairing students with beginning English language skills with students who have more advanced English language skills • Scaffolding •Word walls •Sentence frames •Think-pair-share •Cooperative learning groups •Teacher think-aloud	
Teacher Resources	*Teacher Note*
• Unit circle graphic organizer • Graph paper • Algebra II, HMH, 2012 edition	It is preferred that the graphing activity be done on oversized graph paper, if available.