

HILLSBOROUGH TOWNSHIP SCHOOL DISTRICT

MATHEMATICS CURRICULUM

Algebra 2

July, 2020

Course Overview

Algebra 2

The algebra 2 curriculum is written so that learners will be taught the mathematics that addresses the needs of students in both the college preparatory and honors classes. This course is structured around the New Jersey Student Learning Standards.

Topics that will be covered will include solving equations and inequalities of linear and quadratic functions and their graphs, probability and statistics, absolute value functions and graphs, systems of equations, matrices, polynomial and radical functions, exponential and logarithmic functions, rational functions, sequences and series, periodic functions that also include trigonometry identities and equations, data analysis, discrete math and, if time permits, conic sections.

A variety of tools and strategies will be incorporated into the curriculum to enhance the learning of every child. Such technological tools include a digital textbook with built in features such as Desmos, instructional videos and practice with feedback. The course helps prepare students to sit for the New Jersey State Learning Assessment for Algebra 2 as well as any high school graduation assessment yet to be developed and implemented. Students who successfully complete algebra 2 will be eligible and ready for what the State of New Jersey calls a fourth year mathematics course which may include algebra 3 and trigonometry, math analysis, selected topics of college mathematics, or applications of mathematics.

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Unit Title: Unit 1 Linear Functions	Time frame/Pacing: 15 Days
Essential Questions <ul style="list-style-type: none"> • How can you use a linear function to model and analyze a real life situation? 	
Enduring Understandings <ul style="list-style-type: none"> • Algebraic representations can be used to generalize patterns and relationships. 	
Standards Taught and Assessed <ul style="list-style-type: none"> • A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • A.CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. • F-IF.A.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. 	
Highlighted Interdisciplinary Connections <ul style="list-style-type: none"> • (ELA) NJSLA.SL.1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. • (SS) 6.1.12 .HistoryCA.5.a: Assess the effectiveness of public education in fostering national unity and American values and in helping people meet their economic needs and expectations. 	
Highlighted Career Ready Practices and 21st Century Themes and Skill <ul style="list-style-type: none"> • (CR) 9.4.12.CL.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). • (CR) 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). 	
Social Emotional Learning Competencies <ul style="list-style-type: none"> • (CHPE) 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a 	

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healthy lifestyle.				
Pre-Assessment A.CED.A.2; A.CED.A.3; F-IF.A.1		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish		
Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.	SMP 7 - Make sense and look for structure.	Write the equation of a linear function by looking at a graph, or by various given information.	Guided notes, group activities (make this more specific), practice worksheets.	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	SMP 4 - Model with mathematics.	Have students create a scatter plot and identify correlation. If a positive or negative correlation exists, students will write a line of best	Create a table of values where the student heights (in inches) are the domain and the length their feet (in inches) are the range. Find the line of best fit to make predictions.	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.

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		fit.		
A.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.	SMP 7 - Look for and make use of structure.	Visualize solutions of systems of linear equations in three variables. Solve systems of linear equations in three variables algebraically. Solve real life problems.	A theater charges \$75 for a seat in section A, \$55 for each seat in section B, & \$30 for a lawn seat. There are three times as many seats in section B as in section A. The revenue for selling 23,000 seats is \$870,000. How many seats in each section?	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
Benchmark Assessment		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)		
<ul style="list-style-type: none"> ● Benchmark 1 		As per student's IEP's and 504's, for example: extra time, use of calculator.		
Summative Assessment(s)		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)		
<ul style="list-style-type: none"> ● Common Assessment 1: A.CED.A.2, F-IF.A ● Common Assessment 2: A.CED.A.3 ● Performance Task Unit 1 		As per student's IEP's and 504's, for example: extra time, use of a calculator.		

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Unit Title: Unit 2 Quadratic Functions	Time frame/Pacing: 26 Days
Essential Questions <ul style="list-style-type: none">• How can you use a quadratic function to model and analyze a real life situation?	
Enduring Understandings <ul style="list-style-type: none">• Quadratic functions can have one real, two real or two imaginary solutions.	
Standards Taught and Assessed <ul style="list-style-type: none">• F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(x+k)$, $f(kx)$ //HONORS for specific values of k (both positive and negative); Experiment with cases and illustrate an explanation on the effects on the graph using technology.• F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.• F-IF-C.7c - Graph polynomial functions, identifying zeros when suitable factorizations are available.• F-IF-C.9 - Compare properties of two functions, each represented in a different way (algebraically, graphically, or by verbal descriptions).• F-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• A-APR.B.3 - Identify zeros of polynomials when suitable factorizations are available, and use zeros to construct a rough graph of the function described by the polynomial.• A-REI.B.4b- Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.• N-CN.C.7 - Solve quadratic equations with real coefficients that have complex solutions.• N-CN.CA.1-Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.• N-CN.CA.2- Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract and multiply complex numbers.• A-REI.D.11- Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.• A-CED.A.1 (HONORS ONLY) - 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.	

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Highlighted Interdisciplinary Connections				
<ul style="list-style-type: none"> • (ELA) NJSLSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. 				
Highlighted Career Ready Practices and 21st Century Themes and Skill				
<ul style="list-style-type: none"> • (CR) 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). • (CR) 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.). 				
Social Emotional Learning Competencies				
<ul style="list-style-type: none"> • CHPE. 2.1.12.EH.1: Recognize one’s personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 				
Pre-Assessment F-IF.B.4; F-IF.C.8a; A-APR.B.3		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish		
Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(x+k)$, $f(kx)$ //HONORS for specific values of k (both positive and negative); Experiment with cases and illustrate an explanation on the effects on the graph using technology.	SMP 2 – Reason abstractly and quantitatively.	Describe transformations of quadratic functions. Write transformations of quadratic functions.	Describe the transformation of the graph and identify the vertex. $f(x) = -4(x + 1)^2 - 5$	As per student’s IEP’s and 504’s, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.

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<p>F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</p>	<p>SMP 3 – Construct viable arguments and critique the reasoning of others.</p> <p>SMP 8 – Look for and express regularity in repeated reasoning.</p>	<p>Explore properties of parabolas. Find maximum and minimum values of quadratic functions.</p>	<p>Graph the function. Label the vertex and axis of symmetry. Identify the domain and range of the function. Will there be a maximum or minimum? How do you know? Describe where the function is increasing and decreasing. $f(x) = 2(x+5)^2 + 3$</p>	<p>As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>F-IF-C.7c - Graph polynomial functions, identifying zeros when suitable factorizations are available.</p>	<p>SMP 3 – Construct viable arguments and critique the reasoning of others.</p>	<p>Graph quadratic functions.</p>	<p>Graph the function and identify the vertex given the three forms of a quadratic. $f(x) = 3(x + 4)^2 - 6$, $f(x) = -x^2 + x + 12$, $f(x) = 2(x-2)(x+4)$</p>	<p>As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>F-IF-C.9 - Compare properties of two functions, each represented in a different way (algebraically, graphically, or by verbal descriptions).</p>	<p>SMP 4 – Model with mathematics.</p> <p>SMP 6 – Attend to precision.</p>	<p>Explore properties of parabolas. Solve real-world problems.</p>	<p>The engine torque y (in foot-pounds) of one model car is given by $y = -3.75x^2 + 23.2x + 38.8$, where x is the speed (in thousands of revolutions per minute) of the engine. Find the engine speed that maximizes torque. What happens to the engine torque as the speed of the engine increases?</p>	<p>As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>F-IF.C.8a -Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values,</p>	<p>SMP 4 – Model with mathematics.</p>	<p>Explore properties of parabolas. Solve real-world problems.</p>	<p>When an object is dropped, its height h (in feet) above the ground after t seconds can be modeled by the function $h = -16t^2$</p>	<p>As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes,</p>

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and symmetry of the graph, and interpret these in terms of a context			$+h_0$, where h_0 is the initial height. If a seashell is dropped from a height of 40 ft, write an equation that models the height above water. How long is the seashell in the air?	challenge problems, student resources in Spanish.
A-APR.B.3 - Identify zeros of polynomials when suitable factorizations are available, and use zeros to construct a rough graph of the function described by the polynomial.	SMP 4 – Model with mathematics. SMP 8 – Look for and express regularity in repeated reasoning.	Explore properties of parabolas. Solve real-world problems.	The path of a basketball thrown at an angle of 45 degrees can be modeled by $y = -.02x^2 + x + 6$, where x represents time in seconds and y is the height of the ball. After how many seconds will the ball hit the ground?	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
A-REI.B.4b - Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .	SMP 2 – Reason abstractly and quantitatively.	Solve quadratic equations by graphing and algebraically.	Solve the equation both by graphing and algebraically. $3x = \frac{1}{4}x^2 + 5$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
N-CN.C.7 - Solve quadratic equations with real coefficients that have complex solutions.	SMP 7 – Look for and make use of structure.	Find complex solutions and zeros. Solve quadratic equations using square roots.	Find the zeros of the function. $f(x) = -\frac{1}{2}x^2 - 24$ Solve the equation. $(x-7)^2 = 9$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.

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<p>N-CN.CA.1-Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.</p>	<p>SMP 2 – Reason abstractly and quantitatively.</p>	<p>Define and use the imaginary unit i.</p>	<p>Solve the equation $x^2 + 16 = 0$.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>N-CN.CA.2- Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract and multiply complex numbers.</p>	<p>SMP 8 – Look for and express regularity in repeated reasoning.</p>	<p>Add, subtract, and multiply complex numbers.</p>	<p>Simplify the expression $(2-3i)^2 - (4 + 5i)$.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>A-REI.D.11- Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p>	<p>SMP 3 – Construct viable arguments and critique the reasoning of others.</p>	<p>Solve quadratic equations by graphing.</p>	<p>Solve the system by graphing. $y = x + 2$ $y = \frac{1}{2}(x + 2)^2$</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>

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<p>A-CED.A.1 (HONORS ONLY) - 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.</p>	<p>SMP 4 – Model with mathematics.</p>	<p>Solve quadratic inequalities in one variable.</p>	<p>A rectangular parking lot must have a perimeter of 440 feet and an area of at least 8000 square feet. Describe the possible lengths of the parking lot.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Quarterly Test 1 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>		
<p>Summative Assessment(s)</p> <ul style="list-style-type: none"> ● Common Assessment 1: F-BF.B.3, F-IF.B.4 ● Common Assessment 2: F-IF.C.8a, A-APR.B.3, A-REI.B.4b ● Common Assessment 3: N-CN.CA.1, N-CN.CA.2 ● Performance Task Unit 2 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>		

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Unit Title: Unit 3 Polynomial Functions	Time frame/Pacing: 24 Days
Essential Questions	
<ul style="list-style-type: none"> ● How can you use the factors of a polynomial to solve a polynomial equation? 	
Enduring Understandings	
<ul style="list-style-type: none"> ● Add, subtract, multiply, divide and solve polynomials. Graph polynomials (Honors only) ● Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. ● Algebraic representation can be used to generalize patterns and relationships. 	
Standards Taught and Assessed	
<ul style="list-style-type: none"> ● F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. (Honors only) ● F-IF.C.7c - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. (Honors only) ● A-APR.A.1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials ● A-APR.C.4 - Prove polynomial identities and use them to describe numerical relationships. For example, the difference of two squares, the sum and difference of two cubes, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples. ● A-APR.C.5 - Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. (Algebra 2 Honors only) ● A-APR.B.2 - Know and apply the remainder Theorem: for a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. ● A-APR.D.6 - Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. ● A-SSE.A.2 - Use the structure of an expression to identify ways to rewrite it. ● A-APR.B.2 - Know and apply the remainder Theorem: for a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. ● A-APR.B.3 - Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (Honors Only) Use the Fundamental Theorem of Algebra. 	

Key: ■ Major Cluster □ Supporting Cluster ⊙ Additional Cluster

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<p>Highlighted Interdisciplinary Connections</p> <ul style="list-style-type: none"> ● (ELA) NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. 	
<p>Highlighted Career Ready Practices and 21st Century Themes and Skill</p> <ul style="list-style-type: none"> ● (CR) 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). ● (CR) 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes. 	
<p>Social Emotional Learning Competencies</p> <ul style="list-style-type: none"> ● CHPE. 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 	
<p>Pre-Assessment</p> <ul style="list-style-type: none"> ● A-APR.C.5 ● A-APR.A.1 ● A-SSE.A.2 	<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p> <p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish</p>

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Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. (Honors only)	SMP 7 - Make sense and look for structure.	(Honors Only) Identify polynomial functions.	Describe the end behavior. $f(x) = -5x^4 + 7x^3 - 9x$ $g(x) = 12 - 6x + x^5$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
F-IF.C.7c - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. (Honors only)	SMP 4 - Model with mathematics.	(Honors Only) Graph polynomial functions using tables and end behavior.	Graph the polynomial function. $f(x) = x^3 + x + 3$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
A-APR.A.1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials	SMP 7 - Look for and make use of structure.	Add and subtract polynomials.	Simplify the polynomial expression. $(3x^2 - 6x + 8) + (x^3 + 5x - 9)$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish

Key: ■ Major Cluster □ Supporting Cluster ⊙ Additional Cluster

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<p>A-APR.C.4 - Prove polynomial identities and use them to describe numerical relationships. For example, the difference of two squares, the sum and difference of two cubes, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.</p>	<p>SMP 6 Attend to precision.</p>	<p>Multiply polynomials.</p>	<p>Simplify the expression. $(x^2 - 8)(x-9)$</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>A-APR.C.5 - Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. (Honors only)</p>	<p>SMP 7 - Look for and make use of structure.</p>	<p>(Honors Only) Use Pascal's Triangle to expand binomials.</p>	<p>Expand the binomial: $(x+2)^5$</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>A-APR.B.2 - Know and apply the remainder Theorem: for a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.</p>	<p>SMP 7 - Look for and make use of structure.</p>	<p>Use the remainder theorem.</p>	<p>Find the value of $f(5)$ using synthetic substitution given $f(x)=4x^4+3x^2-x+5$</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>A-APR.B.3 - Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function</p>	<p>SMP 4 - Model with mathematics.</p>	<p>Factor polynomials. Find the solutions of polynomial equations and zeros of polynomial</p>	<p>Identify the zeros of the polynomial. $f(x)=x(x-3)(x-6)(x+1)$. List the possible rational roots of the</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems,</p>

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defined by the polynomial.		functions. Use the Rational Root Theorem. Use the Irrational Conjugates Theorem.	polynomial and then find all the real zeros. $h(x)=x^3+10x^2+31x+30$	student resources in Spanish.
A-APR.D.6 - Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.	SMP 8 Look for and express regularity in repeated reasoning.	Use synthetic division to divide polynomials by binomials of the form $(x - k)$. Use long division to divide polynomials by other polynomials.	The volume of a rectangular prism is given $V=2x^3+17x^2+46x+40$ with a height of $(x+2)$ and a width of $(x+4)$. Find the length of the prism.	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-SSE.A.2 - Use the structure of an expression to identify ways to rewrite it.	SMP 8 Look for and express regularity in repeated reasoning.	Factor polynomials.	Factor completely: a) $a^3 + 27$ b) $x^3 + 4x^2 - x - 4$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-APR.B.3 - Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	SMP 6 Attend to precision.	(Honors Only) Use the Fundamental Theorem of Algebra.	Find all the zeros and construct a graph. $g(x)=x^4 - x^2 - 6$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.

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<p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Not Applicable 	<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of calculator.</p>
<p>Summative Assessment(s)</p> <ul style="list-style-type: none"> ● Common Assessment 1: A-APR.A.1, A-APR.D.6 ● Common Assessment 2: A-APR.B.3 ● Performance Task Unit 3 	<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>

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Unit Title: Unit 4 Rational Exponents and Radical Functions	Time frame/Pacing: 22 Days
Essential Questions	
<ul style="list-style-type: none"> ● How can you use a rational exponent to represent a power involving a radical? 	
Enduring Understandings	
<ul style="list-style-type: none"> ● Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways. ● The same pattern can be found in many different forms. ● Patterns and relationships can be represented graphically, numerically, symbolically, or verbally. 	
Standards Taught and Assessed	
<ul style="list-style-type: none"> ● N-RN.A.1 - Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents ● N-RN.A.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents. ● F-IF.C.7b - Graph square root, cube root, and piecewise-defined functions and absolute value functions. ● F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$... $f(x+k)$ for specific values of k (both positive and negative); ... Experiment with cases and illustrate an explanation on the effects on the graph using technology. ● A-REI.A.2 - Solve simple radical equations in one variable, and give examples showing how extraneous solutions may arise. ● A-CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. ● F-BF.B.4a - Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. 	
Highlighted Interdisciplinary Connections	
<ul style="list-style-type: none"> ● (ELA) NJLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 	
Highlighted Career Ready Practices and 21st Century Themes and Skill	
<ul style="list-style-type: none"> ● (CR) 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.). ● (CS) 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture. 	

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Social Emotional Learning Competencies <ul style="list-style-type: none"> ● CHPE: 2.1.8.EH.2: Analyze how personal attributes, resiliency, and protective factors support mental and emotional health. 				
Pre-Assessment <ul style="list-style-type: none"> ● F-BF.B.3 ● A-CED.A.4 		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish		
Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
N-RN.A.1 - Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents	SMP 7 - Make sense and look for structure.	Find nth roots of numbers. Solve equations using nth roots.	Solve for x. $x^3=125$ $x^2-64=0$ $x^4=81$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
N-RN.A.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents.	SMP 8 Look for and express regularity in repeated reasoning.	Evaluate expressions with rational exponents. Use properties of rational exponents to simplify expressions with rational exponents. Use properties of radicals to simplify and write radical	Simplify the expression. $(27)^{\frac{2}{3}}$ Simplify. $\frac{6xy^{3/4}}{3x^{1/2}y^{1/2}}$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.

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		expressions in simplest form.		
F-IF.C.7b - Graph square root, cube root, and piecewise-defined functions and absolute value functions.	SMP 7 - Look for and make use of structure.	Graph radical functions.	Graph $f(x)=\sqrt[3]{x}$ State the domain and range of the graph.	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$... $f(x+k)$ for specific values of k (both positive and negative).	SMP 6 Attend to precision.	Graph transformations of radical functions.	Graph $f(x)=\sqrt[3]{x}$ Shift the graph two units left and four units down. Write the equation for the new graph.	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-REI.A.2 - Solve simple...radical equations in one variable, and give examples showing how extraneous solutions may arise.	SMP 7 - Look for and make use of structure.	Solve equations containing radicals and rational exponents. Solve radical inequalities.	Solve for x . $\sqrt{44-2x} = x - 10$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	SMP 7 - Look for and make use of structure.	Explore inverses of functions.	Find the inverse of $f(x)$ and determine if it is a function. Draw $f(x)$ and its inverse on the same coordinate plane. State the domain and range of each. $f(x)=\sqrt{x-2}+3$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.

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<p>F-BF.B.4a - Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.</p>	<p>SMP 4 Model with mathematics.</p>	<p>Find and verify inverses of nonlinear functions. Solve real-life problems using inverse functions.</p>	<p>The maximum hull speed v (in knots) of a boat with a displacement hull can be approximated by $v=1.34\sqrt{l}$, where l is the waterline length (in feet) of the boat. Find the inverse function. What waterline is needed to achieve a maximum speed of 7.5 knots?</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>Benchmark Assessment</p> <ul style="list-style-type: none"> • Quarterly Assessment 2 • Benchmark 2 		<p>Modifica(Honors Only) Use the Fundamental Theorem of Algebra. tions/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of calculator.</p>		
<p>Summative Assessment(s)</p> <ul style="list-style-type: none"> • Common Assessment 1: N-RN.A.2, F-IF.C.7b • Common Assessment 2: A.REI.A.2 • Performance Task Unit 4 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>		

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Unit Title: Unit 5 Exponential and Logarithmic Functions	Time frame/Pacing: 20 Days
<p>Essential Questions</p> <ul style="list-style-type: none"> ● What are some of the characteristics of the graphs of exponential functions? ● How can the properties of exponents be used to derive the properties of logarithms? 	
<p>Enduring Understandings</p> <ul style="list-style-type: none"> ● Exponential and logarithmic functions are inverse functions that can be used to answer real life questions in personal finance and natural phenomena. 	
<p>Standards Taught and Assessed</p> <ul style="list-style-type: none"> ● F-IF.C.7.e- Graph exponential and logarithmic functions, showing intercepts and end behavior. ● F-IF.C.8.b- Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay. ● F-BF.B.3- Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ 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 ● A-SSE.A.2- Use the structure of an expression to identify ways to rewrite it. ● F-LE.A.4- Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. 	
<p>Highlighted Interdisciplinary Connections</p> <ul style="list-style-type: none"> ● (ELA) NJLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. ● (S) HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. ● (S) HS-PS4-5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. ● (S) HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. ● (SS) 6.1.12.HistoryCA.5.a: Assess the effectiveness of public education in fostering national unity and American values and in helping 	

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<p>people meet their economic needs and expectations.</p> <ul style="list-style-type: none"> ● (SS) 6.1.12.EconNE.6.a: Analyze the impact of money, investment, credit, savings, debt, and financial institutions on the development of the nation and the lives of individuals. 				
<p>Highlighted Career Ready Practices and 21st Century Themes and Skill</p> <ul style="list-style-type: none"> ● (CR) 9.1.12.PB.6: Describe and calculate interest and fees that are applied to various forms of spending, debt and saving. ● (CR) 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). ● (CS) • 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture. 				
<p>Social Emotional Learning Competencies</p> <ul style="list-style-type: none"> ● CHPE. 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 				
<p>Pre-Assessment F-BF.B.3</p>		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish</p>		
<p>Student Learning Objectives: We are learning to/that...</p>	<p>Student Strategies (Mathematical Practices)</p>	<p>Formative Assessment</p>	<p>Activities and Resources</p>	<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p>
<p>F-IF.C.7.e- Graph exponential and logarithmic functions, showing intercepts and end behavior.</p>	<p>SMP 4- Model with mathematics.</p>	<p>Graph exponential growth and decay functions.</p> <p>Graph logarithmic functions.</p> <p>Explain the inverse</p>	<p>Graph $y=(2)^x$</p> <p>Graph $y=\log_2x$</p> <p>State the domain and range of each graph.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>

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		relationship between the two functions.	Identify the asymptotes of the graphs.	
F-IF.C.8.b- Use the properties of exponents to interpret expressions for exponential functions.	SMP 4- Model with mathematics.	Use exponential models to solve real-life problems.	You deposit \$9000 in an account that pays 1.46 % annual interest. Find the balance after three years when the interest is compounded quarterly.	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
F-BF.B.3- Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ 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	SMP 3 – Construct viable arguments and critique the reasoning of others.	Transform graphs of exponential functions. Transform graphs of logarithmic functions.	Graph $y=3^x$ and $y=3^{x+1}-7$ on the same coordinate plane. Describe how the second graph is transformed from the first. Graph $f(x)=\log_4 x$ $g(x)=\log_4(x-5)+3$ on the same coordinate plane. describe the transformation of $f(x)$ represented by $g(x)$. Include the domain and range for each set of functions..	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
A-SSE.A.2- Use the structure of an expression to identify ways to rewrite it.	SMP 8 – Look for and express regularity in repeated reasoning.	Use the properties of logarithms to expand or condense logarithmic expressions.	Write the expression as a single logarithm. $4\log_5 y - \log_5 3 - \log_5 x$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.

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<p>F-LE.A.4- Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.</p>	<p>SMP 6- Attend to precision.</p>	<p>Use the properties of logarithms to evaluate logarithms.</p> <p>Use the change-of-base formula to evaluate logarithms.</p> <p>Solve exponential equations. Solve logarithmic equations.</p> <p>Solve exponential and logarithmic inequalities (inequalities in Honors only).</p>	<p>Evaluate the logarithm without a calculator using the properties of logarithms. $\log_3 6 - \log_3 2$</p> <p>Evaluate $\log_7 19$ using the change-of-base formula and a calculator.</p> <p>Solve for x-</p> <p>$3^x = 7$</p> <p>$\log_3(x-9) + \log_3(x-3) = 2$</p> <p>$10^{2x} - 6 > 3$</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>Benchmark Assessment</p> <ul style="list-style-type: none"> Not applicable 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p> <p>As per student's IEP's and 504's, for example: extra time, use of calculator.</p>		
<p>Summative Assessment(s)</p> <ul style="list-style-type: none"> Common Assessment 1: F-IF.C.7.e, F-BF.B.3 Common Assessment 2: F-LE.A.4, A-SSE.A.2, F-IF.C.8.b Performance Task Unit 5 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p> <p>As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>		

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Unit Title: Unit 6 Rational Functions	Time frame/Pacing: 22 Days
Essential Questions	
<ul style="list-style-type: none"> ● How do the four basic operations apply when we simplify and solve rational equations? 	
Enduring Understandings	
<ul style="list-style-type: none"> ● Recognize when two quantities vary directly or inversely. ● Recognize the characteristics of the graph of a rational function (Honors only). ● Determine the excluded values in a product or quotient of two rational expressions. ● A rational function is a ratio of polynomial functions. If a rational function is in simplified form and the polynomial in the denominator is not a constant, the graph of the rational function features asymptotic behavior. 	
Standards Taught and Assessed	
<ul style="list-style-type: none"> ● A-CED.A.1 - Create equations in one variable and use them to solve problems. ● A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities. ● A-CED.A.3 - Represent constraints by equations, and interpret solutions as viable or nonviable options in modeling context. ● A.CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. ● A-APR.D.6 - Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in forms $q(x) + r(x)/b(x)$, where $a \neq 0$, $b(x)$, $q(x)$ and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using long division. ● F-BF.B.3 - Identify the effect on replacing $f(x)$ by $f(x) + k$, $kf(x)$, and $f(x + k)$ for specific values of k (both positive and negative). Experiment with cases and illustrate an explanation of the effects on the graph using technology. ● A-APR.D.6 - Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in forms $q(x) + r(x)/b(x)$, where $a \neq 0$, $b(x)$, $q(x)$ and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, or the for the more complicated example, a computer algebra system. ● A-APR.D.7 - Understand that rational expressions form a system analogous to the rational numbers, closed under multiplications, and division by a nonzero rational expression; multiply, and divide rational expressions. ● A-REI.A.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. ● A-REI.A.2 Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise. 	

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Highlighted Interdisciplinary Connections				
<ul style="list-style-type: none"> • (ELA) NJLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 				
Highlighted Career Ready Practices and 21st Century Themes and Skill				
<ul style="list-style-type: none"> • (CR) 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 				
Social Emotional Learning Competencies				
<ul style="list-style-type: none"> • CHPE: 2.1.8.EH.2: Analyze how personal attributes, resiliency, and protective factors support mental and emotional health. 				
Pre-Assessment		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)		
<ul style="list-style-type: none"> • A-CED.A.1 • A-CED.A.4 		As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish		
Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
A-CED.A.1 - Create equations in one variable and use them to solve problems.	SMP 7 - Make sense and look for structure.	Classify direct and inverse variations.	Ask students to give examples of two quantities that vary directly and two that vary indirectly.	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities.	SMP 8 Look for and express	Write inverse variation equations	Y varies inversely with x. $y = 15$ when $x = 5$. Write an equation. What is y	As per student's IEP's and 504's, for example: extra time, provide copy of notes,

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	regularity in repeated reasoning.		when $x=8$?	challenge problems, student resources in Spanish.
A-CED.A.3 - Represent constraints by equations, and interpret solutions as viable or nonviable options in modeling context.	SMP 7 - Look for and make use of structure.	Solve real-life problems.	It takes two people 10 days to paint a house. It takes 4 people 5 days to paint a house. If the number of days varies inversely with the number of people, how long would it take 6 people to paint the house?	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
A.CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	SMP 4 Model with mathematics.	Use inverses of functions.	The function $c = \frac{50m + 1000}{m}$ represents the average cost c (in dollars) of making m models using a 3-D printer. How many models must be printed for the average cost c to be \$90?	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-APR.D.6 - Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in forms $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$ and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using long	SMP 7 - Look for and make use of structure.	Divide rational expressions. (Honors Only) Graph Rational Functions. Identify the asymptotes and transformations when rewritten.	Find the quotient $\frac{4x}{5x-20} \div \frac{x^2-2x}{x^2-6x+8}$ Graph: $f(x) = \frac{2x+1}{x-3}$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.

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division.				
A-APR.D.7 - Understand that rational expressions form a system analogous to the rational numbers, closed under multiplications, and division by a nonzero rational expression; multiply, and divide rational expressions.	SMP 7 - Look for and make use of structure.	Multiply rational expressions. Simplify rational expressions.	Find the product $\frac{x^2-3x}{x-2} \cdot \frac{x^2+x-6}{x}$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-REI.A.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	SMP 3 - Construct a viable argument and critique the reasoning of others	Solve rational equations by cross multiplying	Solve for x $\frac{4}{x} = \frac{5}{x+6}$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
A-REI.A.2 Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise.	SMP8 Look for and express regularity in repeated reasoning.	Solve rational equations by using the least common denominator.	Solve for x $\frac{2}{x-3} - \frac{1}{x} = \frac{x-1}{x-3}$	As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
Benchmark Assessment <ul style="list-style-type: none"> • Quarterly 3 	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of calculator.			

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<p>Summative Assessment(s)</p> <ul style="list-style-type: none">● Common Assessment 1: A-CED.A.1, A-CED.A.2● Common Assessment 2: A-APR.D.7● Common Assessment 3: A-REI.A.● Performance Task Unit 6	<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p> <p>As per student's IEP's and 504's, for example: extra time, use of a calculator.</p>
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Unit Title: Unit 7 Sequences & Series	Time frame/Pacing: 16 Days
Essential Questions <ul style="list-style-type: none"> ● Can a pattern be identified in the sequence of numbers? ● Is the sequence arithmetic, geometric or neither? 	
Enduring Understandings <ul style="list-style-type: none"> ● Identifying a pattern from a sequence of numbers and then writing a function for a given pattern has numerous real world applications. 	
Standards Taught and Assessed <ul style="list-style-type: none"> ● F-IF.A.3 - Recognize that sequences are functions whose domain is a subset of the integers. ● F-BF.A.2 - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate them ● F-BF.A.1a - Determine an explicit expression, a recursive process, or steps for calculation from context. 	
Highlighted Interdisciplinary Connections <ul style="list-style-type: none"> ● (ELA) NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. 	
Highlighted Career Ready Practices and 21st Century Themes and Skill <ul style="list-style-type: none"> ● (CR) 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. ● (CS) 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture. 	
Social Emotional Learning Competencies <ul style="list-style-type: none"> ● CHPE. 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 	
Pre-Assessment F-IF.A.3	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish

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Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
<p>F-IF.A.3 - Recognize that sequences are functions whose domain is a subset of the integers.</p>	<p>SMP 6- Attend to precision</p>	<p>Use sequence notation to write terms of sequences. Write a rule for the nth term of a sequence.</p> <p>Sum the terms of a sequence to obtain a series and use summation notation.</p> <p>Evaluate recursive rules for sequences.</p>	<p>Describe the pattern, write the next term, graph the first five terms, and write a rule for the nth term. 3, 8, 15, 24, ...</p> <p>Find the sum. $\sum_{i=1}^{10} 4\left(\frac{3}{4}\right)^{i-1}$</p> <p>For the sequence above, would it be possible to find the infinite sum? Explain your answer.</p> <p>Given $a_1=7$ and $a_n=a_{n-1}+3$, write the first 5 terms of the sequence.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>F-BF.A.2 - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate them</p>	<p>SMP 6- Attend to precision</p>	<p>Write rules for arithmetic & geometric sequences. Find sums of finite arithmetic & geometric series.</p>	<p>Write a recursive rule for the sequence. Then write an explicit rule and find the 25th term of the sequence. 5, 9, 13, 17, 21, ...</p> <p>Find the sum of the first 40 terms in the sequence above.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>

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<p>F-BF.A.1a - Determine an explicit expression, a recursive process, or steps for calculation from context.</p>	<p>SMP 8 – Look for and express regularity in repeated reasoning.</p>	<p>Write recursive rules for sequences.</p>	<p>Write a recursive rule for the sequence. 2,14, 98, 686, 4802, ...</p>	<p>As per student’s IEP’s and 504’s, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Benchmark 3 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student’s IEP’s and 504’s, for example: extra time, use of calculator.</p>		
<p>Summative Assessment(s)</p> <ul style="list-style-type: none"> ● Common Assessment 1: F-IF.A.3, F-BF.A.2 ● Common Assessment 2: F-BF.A.2 ● Performance Task Unit 7 		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student’s IEP’s and 504’s, for example: extra time, use of a calculator.</p>		

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Unit Title: Unit 8 Trigonometric Ratios and Functions	Time frame/Pacing: 20 Days
Essential Questions <ul style="list-style-type: none"> ● How can you find a trigonometric function of an acute angle? ● How can the Unit Circle be used to define the trigonometric functions of any angle? ● How can sinusoidal graphs be used to model natural phenomena? 	
Enduring Understandings <ul style="list-style-type: none"> ● Trigonometric ratios of right triangles can be used to find unknown measurements in real life applications. 	
Standards Taught and Assessed <ul style="list-style-type: none"> ● F-TF.A.1 - Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. ● F-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 measure of angles traversed counterclockwise around the unit circle. ● F-TF.B.5 - Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ● F-IF.C.7e - Graph trigonometric functions, showing period, midline and amplitude. ● F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$ and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. ● F-TF.C.8 - Prove the Pythagorean identity $\sin^2(x) + \cos^2(x) = 1$ and use it to find $\sin(x)$, $\cos(x)$ or $\tan(x)$ given the $\sin(x)$, $\cos(x)$ or $\tan(x)$ and the quadrant of the angle. (Algebra 2 Honors only) 	
Highlighted Interdisciplinary Connections <ul style="list-style-type: none"> ● (ELA) NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. ● (S) HS-PS4-5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. ● (S) HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. 	
Highlighted Career Ready Practices and 21st Century Themes and Skill <ul style="list-style-type: none"> ● (CR) 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas. ● (CR) 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.). 	

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<ul style="list-style-type: none"> ● (CS) 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture. 				
<p>Social Emotional Learning Competencies</p> <ul style="list-style-type: none"> ● CHPE. 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 				
<p>Pre-Assessment A.CED.A.2; A.CED.A.3; F-IF.A.1</p>		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish</p>		
Student Learning Objectives: We are learning to/that...	Student Strategies (Mathematical Practices)	Formative Assessment	Activities and Resources	Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)
<p>F-TF.A.1 - Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.</p>	<p>SMP 2 - Reason abstractly and quantitatively.</p> <p>SMP 5 – Use the appropriate tools strategically.</p>	<p>Evaluate trigonometric functions of acute angles.</p> <p>Draw angles in standard position. Find coterminal angles. Use radian measure.</p>	<p>In a right triangle, Θ is an acute angle and $\sin \Theta = \frac{4}{7}$. Evaluate the other five trigonometric functions of Θ.</p> <p>Sketch the angle in standard position, 230°. Find one positive and one negative coterminal angle. Then convert the angle to radians.</p>	<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>F-TF.A.2 - Explain how the unit circle in the coordinate plane enables the extension of</p>	<p>SMP 2 - Reason abstractly and quantitatively.</p>	<p>Evaluate trigonometric functions of any</p>	<p>Evaluate the function without using a calculator.</p>	<p>As per student's IEP's and 504's, for example: extra time,</p>

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trigonometric functions to all real numbers, interpreted as radian measure of angles traversed counterclockwise around the unit circle.	SMP 4- Model with mathematics.	angle. Find and use reference angles to evaluate trigonometric functions.	a) $\sec 135^\circ$ b) $\cot\left(\frac{-8\pi}{3}\right)$	provide copy of notes, challenge problems, student resources in Spanish.
F-TF.B.5 - Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	SMP 1- Make sense of problems and persevere in solving them	Solve real-life problems.	You measure the angle of elevation from the ground to the top of a building as 32° . When you move 50 meters closer to the building the angle of elevation is 53° . What is the height of the building?	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
F-IF.C.7e - Graph trigonometric functions, showing period, midline and amplitude	SMP 2 - Reason abstractly and quantitatively.	Explore characteristics or sine and cosine functions. Explore characteristics of tangent and cotangent functions. (Honors Only)	Find the amplitude and period of the function. Then graph. $y = \frac{1}{3} \cos \frac{1}{2}x$ Using a graphing utility, graph $y = \tan x$ and $y = \cot x$. Have students describe what they see.	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
F-BF.B.3 - Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$ and $f(x + k)$ for specific values of k	SMP 6 – Attend to precision.	Stretch and shrink graphs of sine and cosine functions. Translate graphs of	Given $y = \sin x$, write the equation with an amplitude of 5, moved up 3 units and reflected	As per student's IEP's and 504's, for example: extra time, provide copy of notes,

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(both positive and negative); find the value of k given the graphs.		sine and cosine functions. Reflect graphs of sine and cosine functions.	over the x-axis.	challenge problems, student resources in Spanish.
F-TF.C.8 - Prove the Pythagorean identity $\sin^2(x) + \cos^2(x) = 1$ and use it to find $\sin(x)$, $\cos(x)$ or $\tan(x)$ given the $\sin(x)$, $\cos(x)$ or $\tan(x)$ and the quadrant of the angle. (Algebra 2 Honors only)	SMP 2 - Reason abstractly and quantitatively.	Use trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions. Verify trigonometric identities.	Simplify the expression: $\cos x - \cos x \sin^2 x$	As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.
Benchmark Assessment <ul style="list-style-type: none"> Not Applicable 		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of calculator.		
Summative Assessment(s) <ul style="list-style-type: none"> Common Assessment 1: F-TF.A.1, F-TF.A.2, F-TF.B.5 Common Assessment 2: F-IF.C.7e, F-BF.B.3 Performance Task Unit 8 		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.		

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Unit Title: Unit 9 Data Analysis and Statistics	Time frame/Pacing: 15 Days
Essential Questions <ul style="list-style-type: none">• What are the considerations when undertaking a statistical study?	
Enduring Understandings <ul style="list-style-type: none">• Calculate probabilities using normal distribution.• Find margin of error for samples.• Test theoretical probability using sample data.• Recognize bias in sampling.• Begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.• Understand that data sets may be used to predict future events.	
Standards Taught and Assessed <p>S-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.</p> <p>S-IC.A.2 - Decide if a specified model is consistent with results from a given data generating process, e.g. using simulation.</p> <p>S-IC.A.1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.</p> <p>S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.</p> <p>S-IC.B.6 - Evaluate reports based on data.</p> <p>S-IC.B.4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin or error through the use of simulation models for random sampling.</p> <p>S-IC.B.5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.</p>	
Highlighted Interdisciplinary Connections <ul style="list-style-type: none">• (S) HS-LS3-1 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.• (ELA) NJLSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	

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<p>Highlighted Career Ready Practices and 21st Century Themes and Skill</p> <ul style="list-style-type: none"> ● (CR) 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). ● (CS) 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product. ● (CS) 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture. 					
<p>Social Emotional Learning Competencies</p> <ul style="list-style-type: none"> ● CHPE. 2.1.12.EH.1: Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle. 					
<p>Pre-Assessment S-IC.A.2</p>		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish</p>			
<p>Student Learning Objectives: We are learning to/that...</p>	<p>Student Strategies (Mathematical Practices)</p>	<p>Formative Assessment</p>	<p>Activities and Resources</p>		<p>Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504)</p>
<p>S-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.</p>	<p>SMP 7 - Make sense and look for structure.</p>	<p>Calculate probabilities using normal distributions. Use z-scores and the standard normal tables to find probabilities.</p>	<p>A study finds that the weights of infants at birth are normally distributed with a mean of 3270 grams and a standard deviation of 600 grams. An infant is randomly chosen.</p>		<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>

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<p>S-IC.A.2 - Decide if a specified model is consistent with results from a given data generating process, e.g. using simulation.</p>	<p>SMP 4 - Model with mathematics.</p>	<p>Distinguish between populations and samples.</p>	<p>Identify the population and the sample. <i>A survey of 4464 shoppers in the United States found that they spent an average of \$407.02 from Thursday through Sunday during a recent Thanksgiving holiday.</i></p>		<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>
<p>S-IC.A.1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.</p>	<p>SMP 7 - Look for and make use of structure.</p>	<p>Describe experiments.</p>	<p>Describe the experiment. <i>A company's researchers want to study the effects of adding shea butter to their existing hair conditioner. They monitor the hair quality of 30 randomly selected customers using their regular conditioner and 30 randomly selected customers using the new shea butter conditioner.</i></p>		<p>As per student's IEP's and 504's, for example: extra time, provide copy of notes, challenge problems, student resources in Spanish.</p>

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<p>S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.</p>	<p>SMP 6 Attend to precision.</p>	<p>Recognize how randomization applies to experiments and observational studies.</p>	<p>Explain whether the following research topic is best investigated through an experiment or observational study. <i>You want to know whether vigorous exercise in older people results in longer life.</i></p>		<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>S-IC.B.6 - Evaluate reports based on data.</p>	<p>SMP 7 - Look for and make use of structure.</p>	<p>Analyze experimental designs.</p>	<p>Describe how the research topic is best investigated and design a plan. A farmer wants to know whether a new fertilizer affects the weight of the fruit produced by a strawberry plant.</p>		<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>S-IC.B.4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin or error through the use of simulation models for random sampling.</p>	<p>SMP 7 - Look for and make use of structure.</p>	<p>Estimate population parameters. Find margins of error for surveys</p>	<p>A national polling company claims that 54% of U.S. adults are married. You survey 50 people and find that 31 are married. What is the margin of error?</p>		<p>As per student's IEP's and 504's, for example: extra time, provide copies of notes, challenge problems, student resources in Spanish.</p>
<p>S-IC.B.5 - Use data from a randomized experiment to</p>	<p>SMP 4 - Model with mathematics.</p>	<p>Organize data from an</p>	<p>Using the data collected from the</p>		<p>As per student's IEP's and 504's, for</p>

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compare two treatments; use simulations to decide if differences between parameters are significant.		experiment with two samples. Resample data using a simulation to analyze a hypothesis.	two groups, students should create tables and histograms to compare results.		example: extra time, provide copies of notes, challenge problems, student resources in Spanish.
Benchmark Assessment <ul style="list-style-type: none"> ● Quarterly 4 		Modifica(Honors Only) Use the Fundamental Theorem of Algebra. tions/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.			
Summative Assessment(s) <ul style="list-style-type: none"> ● Common Assessment 1: S-IC.A.1 ● Common Assessment 2: S-ID.A.4 ● Common Assessment 3: S-IC.B.5 ● Performance Task Unit 9 		Modifications/Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) As per student's IEP's and 504's, for example: extra time, use of a calculator.			

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Bibliography

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Supplemental Materials/Resources:

Larson, R. & Boswell, L. (2019). *Big ideas math: Algebra 2*. Erie, PA: Big Ideas Learning

Digital Resources:

www.bigideaslearning.com - all print materials are also available digitally along with digital only resources