ROBBINSVILLE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

Mathematics

Algebra 2
Honors Algebra 2

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BOARD OF EDUCATION INITIAL ADOPTION DATE: September, 2017

Course Philosophy

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life—problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

---Science for All Americans, AAAS, 1990.

The New Jersey Core Curriculum Content Standards for Mathematics set a lofty goal for the mathematics curriculum when they state "all of our children, as well as our state and our nation, will be better served by higher expectations, by curricula that go far beyond basic skills and include a variety of mathematical models, and by programs which devote a greater percentage of instructional time to problem-solving learning." The *Common Core Standards* seek to narrow the focus and foster a coherent progression of skills and concepts across grade levels. In addition, the *Common Core Standards* require both mastery of conceptual understanding and procedural fluency. We seek to adopt these practices and share the nation's goal to enrich mathematics education.

It is our belief that the content of a mathematics course is brought to life for the student when it involves the student in investigating real-world applications using inductive and deductive reasoning while working cooperatively with others and communicating mathematically. This is reinforced by the use of technology and the use of real world data. In order to be competitive in today's global, information-based economy, students' mathematics experience must go beyond computation so that they are able to solve real problems, reason effectively, make logical connections, and think mathematically.

The Principles and Standards for School Mathematics published by the National Council of Teachers of Mathematics is a guiding document in the development and articulation of mathematics programs in Robbinsville. A central theme of this document is connections. According to *Principles and Standards*, "Students develop a much richer understanding of mathematics and its applications when they can view the same phenomena from multiple mathematical perspectives. One way to have students see mathematics in this way is to use instructional materials that are intentionally designed to weave together different content strands. Another means of achieving content integration is to make sure that courses oriented toward any particular content area (such as algebra or geometry) contain many integrative problems—problems that draw on a variety of aspects of mathematics, that are solvable using a variety of methods, and that students can access in different ways." (NCTM)

Through engagement in mathematics learning outlined in this curriculum, the students of Robbinsville Public Schools will acquire the mathematical skills, understandings and reasoning to be successful citizens of the world.

Course Description

Grade: 8-12 Credits: 5

Course Length: 1 year Prerequisite(s): Algebra 1

In Algebra II, the properties of the real numbers system as developed in Algebra I are reinforced and the additional properties of the complex number system are developed. Linear and quadratic functions and relations, as well as operations with rational, irrational and imaginary expressions are studied.

Robbinsville Public Schools
Curriculum Map

Algebra 2/ Honors Algebra 2

Presentation Key: R- Review I- Introduce E-Elaborate
(+) represents material only covered as a class in Honors

Content	Section(s)	Blocks College Prep	Blocks Honors	Presentation
Unit 1: Algebra Review		**8**	**7**	
Review Summer Packet	1.1-1.4, Supplement	2	2	**R**
Solving Systems of Linear Equations with 3 Variables	1.5	0.5	.5	**I**
Compound Inequalities Absolute Value Equations and Inequalities	2.5	1	1	**R, E**
Linear Programming	3.4	2	2	**R, I, E**
Reviews and Assessments		2.5	1.5	
Unit 2: Quadratics		**14**	**13**	
Review of Function Notation, Interval Notation (Domain,	Supplement	2	1	**R, E**

Range, Increasing and Decreasing)				
Standard Form of Quadratic Functions	5.2	1	.5	**R, E**
Applications of Quadratic Functions	Supplement	1	1	**I**
Solving Quadratic Equations by Factoring and Square Roots	5.5	1	.5	**R, I, E**
Solving Quadratic Equations by Completing the Square	5.7	1	1	**I**
Solving Quadratic Equations by Quadratic Formula and Discriminant (Real Solutions Only)	5.8	1	.5	**I, E**
Solving Quadratic Equations by Quadratic Formula and Discriminant (Complex Solutions)	5.6, 5.8	2	1	**I**
Vertex Form of Quadratic Functions (Linear and Geometric Transformations)	Supplement	Teach with parent functions	2	**I, E**
Quadratic and Linear Regression	2.4, 5.1	1	1	**I**
Applications of Quadratic and Linear Regression (Using Correlation Coefficient to Determine Appropriate Method)	2.4, 5.1, Supplement	1	2	**I**
Reviews and Assessments		3	2.5	
Unit 3: Polynomials		**10**	**9**	
Classifying Polynomial Functions and Characteristics	6.1, 6.2, Supplement	1	1	**R**

Graphing Polynomial Functions (Factored Form Only)	Supplement	1	1	**I, E**
Dividing Polynomials Long Division	6.3, Supplement	1	1	**I, E**
Dividing Polynomials Synthetic Division	6.3, Supplement	1	1	**I, E**
Theorems About Roots of Polynomial Equations	6.5, 6.6	2.5	2	**I**
Applications of Polynomial Functions	Supplement	1	1	**I**
Review and Assessment		2.5	2	
Unit 4: Parent Functions		**6**	**7**	
Exploration of Parent Graphs	Supplement	2	2 * project	**I, E**
Transforming Parent Graphs	Supplement	2	2	**I, E**
Piecewise Defined Functions	Supplement	If time add 1	1	**I, E**
Review and Assessments		2	2	
Unit 5: Rational and Radical Functions		**11**	**10**	
Determining Asymptotes and Intercepts Algebraically (Vertical and Horizontal Asymptotes Only)	9.3, Supplement	If time add 1	1	**I, E**
Graphing Rational Functions	9.3, Supplement	If time add 2	2	**I**
Simplifying, Multiplying and Dividing Rational Expressions	9.4	1	1	**I**
Adding and Subtracting Rational Expressions	9.5	2	1	**I**
Solving (Simple) Rational Equations and Applications of Rational Equations	9.6	2	1	**I**
Simplifying Radical Expressions and Operations with Radicals	7.1-7.3	1.5	.5	**R, I, E**

Properties of Exponents and Rational Exponents	7.4, 8.2	1	.5	**R, I, E**
Solving (Simple) Radical Equations and Radical Applications	7.5	2	.5	**I**
Reviews and Assessments		1.5	2.5	
Unit 6: Exponential and Logarithmic Functions		**9**	**8**	
Compositions of Functions	7.6	1	1	**I**
Inverse Functions	7.7	1	1	**I**
Logarithmic Functions as Inverses and Solving (Simple) Exponential and Logarithmic Functions	8.3, 8.5, 8.6	1	1	**I, E**
Graphing Logarithmic Functions	8.3, 8.6	.5	.5	**I, E**
Graphing Exponential Functions	8.1, 8.2	.5	.5	**I, E**
Applications of Exponential and Logarithmic Functions	8.1, 8.2, 8.3, 8.6	2	2	**I**
Reviews and Assessments		3	2	
Unit 7: Trigonometry		**13**	**13**	
Right Triangle Trigonometry and Special Right Triangles	14.3, Supplement	3.5	3	**R, E**
Angles in the Coordinate Plane (Graphing, Co-Terminal Angles, Angles and Radians, Reference Angles)	13.2, 13.3	1	1	**I, E**
Circle Equations and their Graphs	10.3, Supplement	1	1	**I**
Deriving the Unit Circle	13.2, Supplement	1	1	**I, E**
Evaluating Trigonometric Expressions (Unit Circle	13.2, 13.3, 14.2, 14.3	2	2	**I, E**

Values and Exact Answers Only)				
Applications of Trigonometry: ASTC, Identities	13.2, 13.3, 14.2, 14.3	2	.5	
Evaluate Trigonometric Expressions Using Inverse Trigonometric Functions	13.2, 13.3, 14.2, 14.3	If time .5	.5	**I, E**
Solving (Simple) Trigonometric Equations Using Inverse Trigonometric Functions	13.2, 13.3, 14.2, 14.3	If time .5	1	**I, E**
Reviews and Assessments		2.5	3	
Unit 8: Graphing Trigonometric Functions		**5**	**7**	
Graphing Sine and Cosine (Amplitude, Frequency, Midline) (+) Reciprocals	13.4, 13.5, 13.7	2	2	**I**
Graphing Tangent (Amplitude, Frequency, Midline) (+) Reciprocals	13.6, Supplement	If time, 1	2	**I**
Practice Graphing Trigonometric Functions, Apply Even and Odd Definitions	Supplement	1	1	**R**
Reviews and Assessments		2	2	
Unit 9: Probability and Statistics		**5**	**5**	
Measures of Central Tendency and Standard Deviation	12.3, 12.4	1	1	**R, I, E**
Sample Surveys	12.5	1	1	**I**
Normal Distribution	12.7	1	1	**I**
Reviews, Projects and Assessments		2	2	

Total:	80	79	

Robbinsville Public Schools
Scope, Sequence and, Assessment

Algebra 2

Unit Title	Unit Understandings and Goals	Recommended Duration	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
Unit 1: Algebra Review	• Review essential concepts from Algebra 1 : Factoring Review, (+) Sum and Difference of Cubes, Solving Linear Equations, Solving Linear Systems of Equations Algebraically, Graphing and Writing Linear Functions • Solve Linear Systems of Three Variables • Write, graph, and solve compound inequalities • Write, graph, and solve absolute value equations and inequalities • Graph systems of linear inequalities • Solve real world application problems involving linear programming	8 blocks (+) 7 blocks	Pretest – Summer Packet Results Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos in Summer Packet	Summer Station Work Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Practice Material, Whiteboard Practice) Student Centered Discovery Packets	Summer Packet QUIZ Unit Test with Varying Types of Questions

Unit 2: Quadratics	• Use proper function and interval notation to represent quadratic functions, their domain and range and their intervals of increasing and decreasing • Identify properties of quadratics and use vertex, axis of symmetry, x-intercept(s), and y-intercept of quadratic functions in standard and vertex form to graph the quadratic • Solve quadratic equations using all methods (factoring, square roots, completing the square, quadratic formula, using technology) (+) Use completing the square to convert from standard form to vertex form (+) Create quadratic equations/functions from their roots/solutions/zeros • Solve real world application problems involving quadratics • Perform operations involving complex numbers (+) rationalize using conjugate pairs • Describe the connection between real vs complex solutions and the graph of a quadratic function • Perform linear and quadratic regression and use the value of the correlation coefficient to determine the best model for the given data (+) Create a quadratic model algebraically given three points using a linear system • Use the regression equation to make predictions regarding data	14 blocks (+) 13 blocks	Brainstorm Poster What do you Know? Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	DESMOS activities and TI-84 activities Student Centered Discovery Packets Review Games Unit Quizzes Exit Slips Partner Pair-n-Compare Open-Ended Questions/PARCC samples from resource binder Class Discussion In-class Assignments: (Group-work, Practice Material, Whiteboard Practice)	Unit Test with Varying Types of Questions Quadratic Project – Desmos or Architecture Design Poster Project
Unit 3: Polynomials and Polynomial Functions	• Write Polynomials in Standard Form • Classify polynomials by their degree and number of terms • Graph and analyze polynomial functions using leading coefficient, end behavior, and multiplicity of factors/roots (+) Write a polynomial function from its zeros • Factor and solve higher-order polynomial equations (grouping method) • (+) Factor a Sum and Difference of Cubes • Use long and synthetic division to completely factor a higher-order polynomial • Use Rational Root Theorem, Fundamental Theorem of Algebra, and Conjugate Root Theorems to write a polynomial as a product of linear factors	10 blocks (+) 9 blocks	Graphic Organizer (see Algebra 2 Resource Binder) Anticipatory Set/Do Nows Daily Homework	Student Centered Discovery Packets Graphing Templates for independent classwork packets Polynomial Long Division Scavenger Hunt Review Games Unit Quiz	Unit Test with Varying Types of Questions (no calc/calc) Projects Authentic Assessments

	• (+) Use Descartes' Rule of Signs and Upper and Lower Bound Theorem to simplify the process of finding rational roots of a polynomial function • Solve real world application problems involving polynomials		Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	Exit Slips Open-Ended Questions/PARCC samples from resource binder Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice)	
Unit 4: Parent and Piece-wise Defined Functions and their Graphs	• Identify the characteristics of parent functions (domain, range, increasing interval(s), decreasing interval(s), constant interval(s), intercepts, parent points • Use the parameters *a, b, h* and *k* to transform parent functions without the use of a calculator • Construct the equation of transformed parent functions and (+) piece-wise defined functions given a description or graph • (+) Create piece-wise defined functions by restricting the domains of transformed parent functions	6 blocks (+) 7 blocks	Parent Graph Discovery (+) Group Presentation Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	Review Games Unit Quizzes Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice) Student Centered Discovery Packets (+) Piecewise Functions Scavenger Hunt	Unit Test with Varying Types of Questions Project

Unit 5: Rational and Radical Expressions and Functions	● Graph rational functions using horizontal asymptotes, vertical asymptotes, x-intercepts, y-intercepts, (+) slant asymptotes, and (+) point(s) of discontinuities ● Simplify, add, subtract, multiply, and divide rational expressions ● Simplify radical expressions of any index (+) divide by rationalizing a denominator ● Convert between radical and rational exponent form ● Solve rational and radical equations algebraically ● Solve real world application problems involving rationals and radicals	11 blocks (+) 10 blocks	Anticipatory Set/Do Nows Daily Homework Quizzes Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	Review Games: I Have Who Has? and Matching Formats Unit Quizzes Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice) Student Centered Discovery Packets (+) Piecewise Functions Scavenger Hunt	Unit Test with Varying Types of Questions Project Authentic Assessments
Unit 6: Exponential and Logarithmic Functions	● Perform Function Operations - combine and compose functions ● Find the inverse of a function graphically and algebraically (+)verify it using the composite function test ● Convert between logarithmic and exponential form ● Solve exponential and logarithmic equations by using inverse operations ● Graph and transform exponential and logarithmic functions ● Solve real world application problems involving exponential functions, including regression problems	9 blocks (+) 8 blocks	Graphic Organizer HW (See resource binder) Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting	Review Games Unit Quizzes Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice	Unit Test with Varying Types of Questions Regression Classwork Activity

			Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles Calculator Explorations	Material, Whiteboard Practice) Student-Centered Learning Packets Combination Cooperative Learning Activity Inverse Function Card Game	
Unit 7: Foundations of Trigonometry: Identities and Equations	● Use Pythagorean theorem to derive and apply the special right triangle rules ● Define sine, cosine, and tangent using similar triangles (+) and their reciprocal functions ● Use trigonometric functions to solve for missing sides and angles in right triangles ● Graph circles in standard form (+) complete the square to convert general to standard form ● Graph angles on the coordinate plane in both radians and degrees and find their co-terminal and reference angles ● Derive the unit circle ● Use properties of the unit circle to evaluate the six trigonometric functions ● Use special right triangle trigonometric ratios to solve inverse trigonometric problems on and (+) off the unit circle ● Solve simple trigonometric equations using special right triangle trigonometric functions and the calculator (+) using algebra (linear, quadratic – factoring ● (+) Use the reciprocal, quotient, and Pythagorean identities to simplify, solve, and verify trigonometric expressions and equations	13 blocks (+) 13 blocks	Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	Review Games Unit Quizzes Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice) Unit Circle Practice Quizzes as Do Nows Student-Centered Learning Packets Derive the Unit Circle Student-Centered Activity	Unit Test with Varying Types of Questions

				Trig Scavenger Hunt	
Unit 8: Graphing Trigonometric Functions	• Differentiate between even and odd functions graphically and (+) algebraically including linear and quadratics - factoring • Translate the sine and cosine functions including amplitude, frequency/period, midline, and (+) phase shift • Translate the tangent function including amplitude, frequency/period, midline, and (+) phase shift • (+)Translate the secant and cosecant function including frequency/period, midline, and (+) phase shift • (+)Translate the co-tangent function including a frequency/period, midline, and (+) phase shift • Create a sine, cosine, tangent (+) cosecant, secant, co-tangent equation based on provided information or a graph	5 blocks (+) 7 blocks	Anticipatory Set/Do Nows Daily Homework Open-Ended Leading Questions Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles Real World Application of High and Low Tide	Review Games Unit Quizzes Exit Slips Open-Ended Questions Class Discussion In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice) Student-Centered Learning and Practice Packets	Unit Test with Varying Types of Questions (+) Graphing Trigonometric Functions Investigation Project and Gallery Walk
Unit 9: Probability and Statistics	• Determine all statistical measures of central tendency based on sample survey, study, or experiment • Analyze and create sample surveys • Analyze data that falls under a normally distributed curve	5 blocks (+) 5 blocks	Pretest Anticipatory Set/Do Nows Daily Homework Quizzes Open-Ended Leading Questions	Review Games Unit Quizzes Exit Slips Open-Ended Questions Class Discussion	Unit Test with Varying Types of Questions Projects Authentic Assessments Core Assessments

			Highlighting Prior Knowledge Previewing New Material by Watching Online Videos/Reading Articles	In-class Assignments: (Group-work, Mini Projects, Practice Material, Whiteboard Practice)	

Robbinsville Public Schools
Algebra 2

Unit 1: Algebra Review

Enduring Understandings:	**Essential Questions:**
● Algebra 2 builds on the concepts previously learned in Algebra 1. A review of the following topics is necessary for success in Algebra 2: compound inequalities, absolute value equations and inequalities, factoring, solving linear equations and linear systems of equations and inequalities ● Use linear programming to optimize and minimize real world applications.	● How do writing equivalent equations help you solve a system of equations? ● How can linear programming be used to maximize profit or minimize cost in real world situations?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
A.SSE.2 A.REI.4b	What different ways can polynomials be factored?	Factor polynomials using grouping, greatest common factor, difference of squares, perfect square trinomial, simple trinomial in quadratic form, complex trinomial in quadratic form, any combination of the above, (+) sum and difference of cubes.	Summer Packet Collection and Review using Stations Videos on Summer Packet Topics Anticipatory sets to measure background knowledge and engage students	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets
A.REI.3	How do you graph a linear equation and solve for its intercepts in any form?	Solve linear equations algebraically. Graph a linear equation, including horizontal and vertical lines, by hand using slope-intercept form or standard form.	Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA		
A.REI.6 A.CED.2	When is it easier to solve a system using substitution versus elimination or vice versa?	Solve a two-variable linear system of equations algebraically using elimination or substitution.			

F.BF.1	How do you write an equation given two points on the line? (+)How is math used to model and optimize real world situations?	Write the equation of a linear function in slope-intercept form given two points on the line. (+) Write linear, quadratic, cubic, and absolute value equations to model and solve real world situations.		• PARCC questions	• PARCC questions • Kahoot Games • Google Forms
A.REI.9	How do you solve a three variable system for a real world situation, such as investing in a three choice investment portfolio?	Solve a three variable linear system of equations by hand (+) and using technology.	Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
A.CED.1*	What is a compound inequality? How does it differ from singular inequalities? What situations can be best represented by compound inequalities? How do you write the solution set for compound inequalities?	Given a verbal sentence, write a compound inequality (and vice versa). Use the properties of inequalities to solve compound inequalities. Graph compound inequalities on a number line. Given a real-life application, write, solve and graph the solution set of a compound inequality.	Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

			https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA		
A.SSE.1.b A.CED.1	What are the similarities between absolute value equations and absolute value inequalities? What are the differences between absolute value equations and absolute value inequalities? How do you write the solution set for absolute value equations and inequalities? Why does it make sense that absolute value equations have two solutions?	Solve absolute value equations and state the rationale for why two solutions are always in the solution set. Given a verbal sentence, write an absolute value inequality (and vice versa). Apply mastery of compound inequalities in order to solve absolute value inequalities.	Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
A.CED.3	How can you use the constraints given in the situation to find the minimum or maximum value? How can you use given information to write a system of inequalities to form the feasible region? How can the Vertex Principle of Linear Programming be	Graph systems of linear inequalities (the constraints) to form the feasible region. Solve real-life application problems using linear programming by testing in the objective function all of the vertices of the feasible region. (+)Solve real-life application problems using linear programming by testing in the objective function all of the vertices of the feasible region using technology, including linear regression.	Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

	useful in finding solutions? (+) How can the use of technology be used to solve linear programming problems?				

<u>Suggestions on how to differentiate in this unit</u>:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• All objectives from unit (see below) • Increase difficulty of practice problems (require more simplification steps) when solving compound inequalities, absolute value equations, and absolute value inequalities • Challenge Problems (Applications and Real World) College Prep Enrichment/Honors On Level: (+)Use technology to solve linear programming problems and systems of three variables (+) factoring sum and difference of cubes. (+) Write linear, quadratic, cubic, and absolute value equations to model and solve real world situations.	• All processes from on level (see below) • Self-guided discovery activity • Student Centered Challenges • Peer to peer teaching	• All products from on level (see below) • Students create their own linear programming word problems and work together to solve them	See below.
ON LEVEL	• Summer Packet Topics • Graph, solve and write compound inequalities • Solve absolute value equations and inequalities • Solve real-life application problems using linear programming by testing in the objective function all of the vertices of the feasible region • Graph systems of linear inequalities (the constraints) to form the feasible region	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity • College Prep only: Review quiz, fix errors, and explain correct solution. Then, retake quizz to obtain average up to 70%	• Verbal Explanations • Whiteboard Answers • Completion of Student Centered Packets • Written demonstration/explanation of content	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology

	• Solve systems of three variable linear equations			
NOT ON LEVEL YET	• All objectives from unit (see above) • Use divide and slide method (Berry method) for factoring complex trinomials when a>1 • Use ten second graph strategy to graph linear equations	• All processes from on level (see above) • Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Proven understanding of objectives in fewer amount of problems • Open notes for activities/assessments	• All products from on level (see above) • Proven understanding of objectives in fewer amount of problems	See above. • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills)

Robbinsville Public Schools
Algebra 2

Unit 2: Quadratics

Enduring Understandings:	**Essential Questions:**
● A function is a special type of relation where each value in the domain is paired with one value in the range. The vertical line test is one way to identify whether a relation is a function. ● The graph of any quadratic function is a transformation of the graph of the parent quadratic function, $y = x^2$. For any quadratic function: $f(x) = ax^2 + bx + c$, the values of *a*, *b,* and *c* provide key information about its graph. ● Three non-collinear points, no two of which are in line vertically, are on the graph of exactly one quadratic function. ● You can solve systems involving quadratic equations using methods similar to the ones sued to solve systems of linear equations. ● To find the zeros of a quadratic function $y = ax^2 + bx + c$, solve the related quadratic equation $0 = ax^2 + bx + c$.	● What are the characteristics/properties of quadratic functions? ● What are the advantages of representing a quadratic function in vertex form? In standard form? ● How is any quadratic function related to the parent quadratic function $y = x^2$? ● How can you solve a quadratic equation? ● How are the real solutions of a quadratic equation related to the graph of the related quadratic function? ● How can you use quadratic and linear functions to model real-world situations?

● You can factor many quadratic trinomials ($ax^2 + bx + c$) into products of two binomials. ● Completing a perfect square trinomial allows you to factor the completed trinomial as the square of a binomial. ● You can solve a quadratic equation $ax^2 + bx + c = 0$ in more than one way. In general, you can find a formula that gives values of x in terms of a, b, and c. ● A basis for the complex numbers is a number whose square is -1. Every quadratic equation has complex number solutions (that sometimes are real numbers). Solving systems of 3					
Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
F.IF.1 F.IF.2 F.IF.5	How do you represent a function's domain and range using interval notation? How do you tell if a function is increasing or decreasing over a specific internal? How do you represent a function's intervals of increasing and decreasing using interval notation?	Determine whether a relation is a function. Find domain and range and use function notation to evaluate functions. Use interval notation to represent the domain and range of a function.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA Create foldable in notebook to find domain and range using the edges of the folds.	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions ● Kahoot Games

					• Google Forms
F.BF.3 A.CED.1 A.CED.2 F.IF.4 F.IF.6 F.IF.7 F.IF.8 F.IF.9	How do you graph quadratic functions? What are their characteristics and properties? What do you need to know/use? How do graphs of various quadratic functions relate to the parent function $f(x) = x^2$?	Identify the vertex, axis of symmetry, and y-intercept of quadratic functions and use them to graph. Graph translations of $f(x) = x^2$. Graph quadratic functions written in standard form.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use DESMOS activities and TI-84 graphing calculators as tools to investigate and discover properties and characteristics of quadratics Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
F.BF.1 F.LE.3	Where do quadratic functions show up in real life? What types of situations can best be modeled by quadratic functions?	Write, graph and solve quadratic functions given various real life situations. Find the maximum or minimum height, when the object reaches the ground and the total time in the air when using the projectile motion formula $(h = -16t^2+vt+c)$.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder

		(+)Maximize volumes are areas of 2D and 3D objects by writing quadratic equations.			
A.SSE.2 A.CED.1 A.APR.3 A.SSE.1.a	How can you use the Zero Product Property to find solutions of quadratic equations? Why does it make sense that quadratic equations can have two solutions?	Find common and binomial factors of quadratic expressions. Factor special quadratic expressions. Solve quadratic equations by factoring and by taking square roots.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
A.REI.4.b	How can you solve quadratic equations by completing the square?	Solve equations by completing the square. Rewrite functions by completing the square. Identify vertex from rewritten vertex form.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
A.REI.4.b	Are all quadratic equations factorable? How do we solve quadratic equations that are not factorable? Do quadratic equations always have two real solutions? Looking at the graph of a quadratic function, why does it make sense that not all quadratic equations have two real solutions?	Solve quadratic equations using the Quadratic Formula. Determine the number of solutions by using the discriminant of the Quadratic Formula. (+) Derive the quadratic formula from the standard form of a quadratic by completing the square.	Same as above Quadratic Formula Derivation Card Sort Pair Activity – Solving by Quadratic Formula and Completing the Square	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
N.CN.1 N.CN.2 N.CN.7 N.CN.8	How are complex numbers similar to real numbers? What properties still hold true? How many solutions can a quadratic equation	Identify, graph and perform operations with complex numbers. (+) Divide by rationalizing denominators Find complex number solutions of quadratic equations.	Same as above	Same as above	Same as above

	have? What type are they?	Determine which method (graphing, factoring, square roots, quadratic formula or completing the square) is most appropriate when solving quadratic equations.			
F.LE.1.a F.IF.4 F.LE.2 F.LE.3 S.ID.6.a	Given a set of data, how can you represent the data with a graphical model? Which model (linear or quadratic) should you use?	Write an equation of a trend line and of a line of best fit for linear and quadratic functions. Use line of best fit and quadratic equations to make predictions.	Same as above Basketball Three Act Activity Movie Data Intro	Same as above	Same as above
A.REI.7 A.CED.3 A.REI.11	How can you use *r*, the correlation coefficient, to determine which model (linear or quadratic) best represents the data?	Use technology to determine the best model for sets of data. Compare and contrast linear and quadratic models for given sets of data.	Same as above	Same as above	Same as above

<u>Suggestions on how to differentiate in this unit</u>:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• All objectives from unit • Increase difficulty of practice problems • Discuss the advantages and disadvantages of graphing quadratic functions in standard and vertex form • Compare and contrast solution methods for quadratic equations in search of finding the more effective method	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Students create their own quadratic word problems and work together to solve them • Generate own data to complete linear and quadratic regression analysis (use values of *r* to determine best model) • Use interval notation to represent the domain and range of quadratic functions	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Graph quadratic functions in standard and vertex form • Solve quadratic equations using all methods obtaining real and complex solutions • Discuss the possible solution methods for quadratic functions and state their rationale for picking the most effective method • Use quadratic and linear regression to model real world data with mathematics	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Use data to complete linear and quadratic regression analysis (use values of *r* to determine best model) • Given real world situations, solve quadratic equations (using all methods) and discuss validity of all solutions • Use interval notation to represent the domain and range of quadratic functions	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Graph quadratic functions in standard and vertex form • Solve quadratic equations using all methods obtaining real and complex solutions • Discuss the possible solution methods for quadratic	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups	• Use data to complete linear and quadratic regression analysis (use values of *r* to determine best model) • Given real world situations, solve quadratic equations (using all methods) and	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers

	functions and state their rationale for picking the most effective method • Use quadratic and linear regression to model real world data with mathematics	• Use flexible grouping to break students into collaborative learning groups • Station activity	discuss validity of all solutions • Use interval notation to represent the domain and range of quadratic functions	• Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 3: Polynomials and Polynomial Functions

Enduring Understandings:	**Essential Questions**
● A polynomial is classified by its degree and number of terms. ● Characteristics from the equation and graph of a polynomial can be used to determine characteristics of the graph of the polynomial. ● If $(x-a)\,(x-a)$ is a factor of the polynomial then $(a,0)\,(a,0)$ is an x-intercept of the polynomial $f(x)\,f(x)$. ● If $(x-a)\,(x-a)$ is a factor of the polynomial then $x=a\;x=a$ is a zero of the polynomial $f(x)\,f(x)$. ● If $(x-a)\,(x-a)$ is a factor of the polynomial then $x=a\;\;x=a$ is a root or solution of the polynomial $f(x)=0\,f(x)=0$. ● The multiplicity of a factor $(x-a)\,(x-a)$ of a polynomial $f(x)$ $f(x)$ affects the behavior of the function at the x-intercept $(a,0)\,(a,0)$. ● You can use Polynomial Long Division and a simplified process of Synthetic Division to help find all the zeros of a polynomial. ● The Fundamental Theorem of Algebra states the degree of the polynomial is equal to the number of roots of a polynomial. ● The Rational Root Theorem provides a list of possible rational roots of the polynomial. ● The Irrational Root Theorem and Complex Root Theorem state that irrational and complex roots occur in conjugate pairs. ● (+) Descartes' Rule of Signs indicates the number of positive and negative real roots.	● How does the leading coefficient and degree of a polynomial affect the end behavior of the polynomial? ● How does the multiplicity of a factor, zero, root or solution affect the behavior of the graph at the corresponding x-intercept? ● What does the degree of the polynomial determine about the graph of the polynomial? ● How can Polynomial Division (Long Division or Synthetic Division) be used to factor a higher order polynomial? ● How can Synthetic Division be used to evaluate a polynomial function? ● What is the purpose of the Rational Root Theorem? ● What does the Fundamental Theorem of Algebra state about the number of roots of a polynomial? ● How can a polynomial function be created knowing only the roots of the function? ● How can Descartes' Rule of Signs be used to refine the list created in by the Rational Root Theorem? (+) ● How can upper and lower bounds be established in the Rational Root Test? (+) ● How can a polynomial function be used to model a given real world scenario?

● Polynomial functions of different degrees and end behaviors can produce accurate models of real world situations.	

Guiding / Topical Questions with Specific Standards		Content, Themes, Concepts, and Skills	Teaching Strategies	Instructional Resources and Materials	Assessment Strategies
F.IF.7.c A.SSE.1.a A.REI.11 A.APR.3 A.SSE.2	How does the degree and leading coefficient of a polynomial affect the shape of the graph of the function? How does the multiplicity of the zeros or factors of a function affect the graph of the function?	Classify a polynomial based on its degree and number of terms. Use the degree and leading coefficient of a polynomial to determine its end behavior, possible number of x-intercepts and number of turning points (maximums/minimums). Graph a polynomial function from factored form. Use multiplicity of factors, roots, zeros, solutions to determine the behavior of the graph of a polynomial at the corresponding x-intercept.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use DESMOS activities and TI-84 graphing calculators as tools to investigate and discover properties and characteristics of quadratics Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities

		Write the equation of a polynomial function in factored form given the graph. (+) Write the equation of a polynomial given its zeros.	Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA Chart Paper Graphing Activity Stations Graphing Practice Activity	• Classwork Activities/ Worksheets • PARCC questions	• Classwork Activities/ Worksheets • PARCC questions • Kahoot Games Google Forms
A.APR.2 A.APR.1 A.APR.6	What methods are necessary to completely factor a higher order polynomial function? How can synthetic division be used to evaluate a function?	Use Polynomial Long Division and Synthetic Division to write a higher order polynomial as a product of linear factors. Use the Remainder Theorem to evaluate a polynomial function. (+) Use grouping method to factor and solve polynomials.	Same as above Scavenger Hunt Classwork Activity	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
N.CN.7 N.CN.8 A.APR.4	What does the degree of a polynomial have to do with the roots of a polynomial? What patterns emerge when determining irrational and complex roots of a polynomial? How does the Rational Root Test aid in determining the roots of a polynomial? (+) How can Descartes' Rule of Signs be used to	Use the Rational Root Test to create a finite list of possible rational roots for a polynomial function. With Synthetic Division, use the Rational Root Test and Factor Theorem to determine the roots of a polynomial. Utilize the Fundamental Theorem of Algebra, Irrational Root Theorem and Complex Root Theorem to completely factor a higher order polynomial function. Use Descartes' Rule of Signs and the creation of upper and lower bounds to refine the process of determining possible	Same as above, and the following: Find the Zeros of a Polynomial from Start to Finish by ThinkwellVids https://www.youtube.com/watch?v=By7sAD8ICSw Using Descartes Rule of Signs by ThinkwellVids https://www.youtube.com/watch?v=5epMpZB1Sck Rational Root Test Discovery	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder

	simplify the process of finding the roots of a polynomial?	rational roots created through the Rational Root Test.			
F.IF.4 F.IF.5 F.IF.6	What real world situations can be modeled using polynomial functions?	Write, graph and solve polynomial functions given various real world scenarios.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• Use the leading coefficient and degree of a polynomial to determine key characteristics of the graph. • Graph polynomial functions in factored form using multiplicity of roots. • Use Synthetic and Long Division to write polynomial functions as products of linear factors. • Apply theorems about the roots of polynomial functions to completely factor higher order polynomials. • Use polynomial models to solve real world problems.	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Students create their own real-world scenarios and work to create polynomial models and solve for specific values. • Students construct their own polynomial problems either graphs or equations and work to produce the opposite. • Given a polynomial function utilize any method of division and all theorems to completely factor the polynomial and produce an accurate graph. • Construct a polynomial model for a real world situation to interpolate or extrapolate additional information about the scenario.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Use the leading coefficient and degree of a polynomial to determine key characteristics of the graph.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into	• Given a polynomial function utilize any method of division and all theorems to completely factor the polynomial and	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction

	• Graph polynomial functions in factored form using multiplicity of roots. • Use Synthetic and Long Division to write polynomial functions as products of linear factors. • Apply theorems about the roots of polynomial functions to completely factor higher order polynomials. • Use polynomial models to solve real world problems.	collaborative learning groups • Station activity	produce an accurate graph. • Construct a polynomial model for a real world situation to interpolate or extrapolate additional information about the scenario.	• Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Use the leading coefficient and degree of a polynomial to determine key characteristics of the graph. • Graph polynomial functions in factored form using multiplicity of roots. • Use Synthetic and Long Division to write polynomial functions as products of linear factors. • Apply theorems about the roots of polynomial functions to completely factor higher order polynomials. • Use polynomial models to solve real world problems.	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given a polynomial function utilize any method of division and all theorems to completely factor the polynomial and produce an accurate graph. • Construct a polynomial model for a real world situation to interpolate or extrapolate additional information about the scenario.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 4: Parent and Piece-wise Defined Functions and their Graphs

Enduring Understandings:	**Essential Questions:**
● Each parent function has unique characteristics that relate to its shape and equation (i.e. domain, range, increasing, decreasing, even/odd, asymptotes) ● Vertex form from Quadratic Functions can be extended to $\frac{x^2-4}{x^2+5x+6}$ $\frac{x^2-4}{x^2+5x+6}$ all families of functions by changing the index or the grouping symbol. (i.e. $f(x) = a\big(b(x-h)\big)^2 + k$ $f(x) = a\big(b(x-h)\big)^2 + k$ becomes $f(x) = a\big(b(x-h)\big)^n + k$ $f(x) = a\big(b(x-h)\big)^n + k$ or $f(x) = a\lvert b(x-h)\rvert + k$ $f(x) = a\lvert b(x-h)\rvert + k$) ● Larger functions can be formed using known functions over specific intervals to create piece-wise defined functions. ● Every graph is a transformation of the parent function.	● How do the parameters a, b, h and k affect the graph of a function? ● How does a function relate to its parent function?

Guiding / Topical Questions with Specific Standards	**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**

F.BF.3 F.IF.04 F.IF.05 F.IF.07. A, B	How are the shapes of the parent graphs related to their equation? What are the unique characteristics of each parent function?	Graph each parent function without using a calculator. Identify the characteristics of parent functions (domain, range, increasing interval(s), decreasing interval(s), constant interval(s), intercept(s), parent points)	(+) Parent Discovery Project Desmos Discovery of Parent Functions and Characteristics Use sliders to discover transformations Use kinesthetic arm motions to describe the shapes of parent functions Kahoot Parent Function Game https://play.kahoot.it/#/lobby?quizId=5aadb5ab-3fc4-4aba-83bb-b744c673e0ef Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions ● Kahoot Games ● Google Forms
F.IF.05 F.IF.07. A, B	What affects do *a, b, h* and *k* have on the parent functions?	Describe the transformations that occur to a parent function based on the *a, b, h* and *k* values. Construct the equation of a transformed parent function based on a written description or graph. (+) a graph with stretches or compressions Graph transformations of the parent functions including quadratic, square root,	Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Matching Card Game Cooperative Learning Activity	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

		cubic, cube root, absolute value, greatest integer and reciprocal functions.	Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA		
F.IF.05 F.IF.07. A, B	When real world scenarios are modeled by different parent functions depending on the domain, how can one function represent them all?	(+) Evaluate piece-wise functions. (+) Graph piecewise functions. (+) Create piecewise functions based on a written description, graph, or real world scenario.	Use colored pencils for each piece of the function Student Centered Discovery Packets Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	● Increase the difficulty level of the problems. ● Extend the idea of vertex form of a function beyond the discussed parent graphs to additional functions. ● Graph parent functions from the vertex form equation of the function. ● Construct the equation of a transformed parent function from data determined from the graph. ● Graph of a piece-wise defined function given the parameters of the function.	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Student created problems for graphing parent functions and/or writing the equation from a graph. • Create the graph of a transformed parent function given the equation. • Write the equation of a transformed parent function given the graph. • Write the equation of a transformed parent function given the description. • Construct the graph of piece-wise function given the function rule. • Evaluate a piece-wise function for a value.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology

ON LEVEL	● Graph parent functions from the vertex form equation of the function. ● Construct the equation of a transformed parent function from data determined from the graph. ● Graph of a piece-wise defined function given the parameters of the function.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Create the graph of a transformed parent function given the equation. • Write the equation of a transformed parent function given the graph. • Write the equation of a transformed parent function given the description. • Construct the graph of piece-wise function given the function rule. • Evaluate a piece-wise function for a value.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	● Graph parent functions from the vertex form equation of the function. ● Construct the equation of a transformed parent function from data determined from the graph. ● Graph of a piece-wise defined function given the parameters of the function.	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Create the graph of a transformed parent function given the equation. • Write the equation of a transformed parent function given the graph. • Write the equation of a transformed parent function given the description. • Construct the graph of piece-wise function given the function rule. • Evaluate a piece-wise function for a value.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

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Unit 5: Rational and Radical Expressions and Functions

Enduring Understandings:	**Essential Questions:**
● Rational functions may have vertical, horizontal, and/or slant asymptotes and/or points of discontinuities due to the restrictions on the variables and the properties of fractions as the variables approach a number. ● Simplifying, adding, subtracting, multiplying, and dividing rational expressions have the same rules as simplifying, adding, subtracting, multiplying, and dividing rational numbers. ● Writing radicals in rational exponent form can make simplifying more efficient and less complicated. ● Real world phenomenon can be modeled with rational and radical equations. There are both algebraic and graphical techniques to solve rational and radical equations.	● What kinds of asymptotes are possible for rational functions? Why? ● (+)Why do the graphs of rational functions have points of discontinuities? ● How are simplifying rational expressions and solving rational equations similar to simplifying rational numbers and solving equations? How do they differ? ● What are the benefits of working with rational exponents versus with radical expressions? ● What real world phenomenon requires us to know how to work with rational and radical expressions and equations?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
F.IF.4 F.IF.7d	What are the four (+six) characteristics of rational functions that help us to create their graphs? How are they found? How can we use the characteristics of rational functions to obtain an accurate graph? What techniques are useful in writing the equations of rational functions given set criteria?	Determine the vertical and horizontal asymptotes, zeros, and y intercept of rational functions. (+) Determine the slant asymptote and point(s) of discontinuity for rational functions. Sketch rational function using the vertical and horizontal asymptotes, zeros, and y intercept without the use of a calculator. Write an equation of a rational function that meets given criteria. (+) Determine the real world interpretation of asymptotes in the context of word problems.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities

	What real world scenarios represent asymptotes in word problems?			• Classwork Activities/ Worksheets PARCC questions	• Classwork Activities/ Worksheets • PARCC questions • Kahoot Games • Google Forms
A.APR.7	How are simplifying, multiplying, and dividing rational expressions similar to and different from simplifying, multiplying, and dividing rational numbers? How is a restriction of a rational function related to its graph?	State the restrictions for rational expressions. Simplify rational expressions. Simplify complex fractions using the LCD technique. Multiply and divide rational expressions.	Same as above Chart comparing rational expression rules to fraction rules Provide factoring support – videos or worked out examples.	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
A.APR.7	How are adding and subtracting rational expressions similar to and different from adding and subtracting rational numbers? How is a restriction of a rational function related to its graph?	Add and subtract rational expressions. Understand that the set of all rational expressions is closed under the operations of addition, subtraction and multiplication.	Same as above Chart comparing rational expression rules to fraction rules Partner Coaching Activity	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
A.REI.2	How are real world work problems and distance, rate, and time problems represented using rational equations?	State the restrictions on rational equations. Solve rational equations by cross multiplying for proportions, by using the LCD technique to eliminate denominators, or by combining fractions to make a proportion.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder

	What is the best method for solving rational equations?	Construct rational functions for real world applications.			
N.RN.1	How does the index of a radical expression affect the technique for simplifying?	Simplify radicals and radical expressions of any index. Add, subtract, multiply, and (+)divide using the conjugate for radical expressions.	Same as above Card Game	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
N.RN.1 N.RN.2	How are radicals related to rational exponents?	Use rational exponents to represent radicals. Simplify radicals in radical form or exponent form.	Same as above Concept attainment discovery of rational exponent properties	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder
A.CED.1 A.SSE.1 A.SSE.3c A.REI.2 A.REI.11 A.SSE.3c F.IF.5 F.IF.9	How can we use rational exponent properties to solve radical equations? How can you verify algebraic techniques for solving radical and rational equations using technology?	Solve radical equations. Transform word problems into radical equations and solve for missing information Determine extraneous solutions for a radical equation Solve rational and radical equations using technology.	Same as above	See items listed above and google docs Algebra 2 Resource Binder	See items listed above and google docs Algebra 2 Resource Binder

<u>Suggestions on how to differentiate in this unit</u>:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• All objectives from unit • Increase difficulty of practice problems in solving	• Self-guided discovery activity	• Construction of some type of study guide for the	• Teach with multiple intelligences in mind • Jigsaw activities

	equations, graphing, and word problems • Explanation of horizontal asymptotes in terms of what happens when the denominator approaches infinity • Slant asymptotes and points of discontinuities can be explored independently • Solving rational equations in multiple ways	• Use flexible grouping to break students into collaborative learning groups • Station activity	characteristics of the graphs of rational functions ● Create and solve word problems involving rational and radical equations	• Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Explanation of horizontal asymptotes using degree rules • Simplify, multiply, divide, add, and subtract rational expressions • Solving rational equations by making proportions or using the LCD technique	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	● Construction of flashcards for the characteristics of the graphs of rational functions ● Solve word problems involving rational and radical equations	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Explanation of horizontal asymptotes using degree rules • Simplify, multiply, divide, add, and subtract rational expressions • Solving rational equations by making proportions or using the LCD technique	• Direct instruction with the teacher • Guided instructions and labeled examples • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	● Construction of flashcards for the characteristics of the graphs of rational functions ● Solve word problems involving rational and radical equations	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 6: Exponential and Logarithmic Functions

Enduring Understandings:	**Essential Questions**
● A function and its inverse undo each other using the property that the input and output of function respectively become the output and input of an inverse function. ● A logarithm is an inverse of an exponential function, written in a different form. Properties of logarithms and logarithmic graphs are based on exponential properties and graphs. ● Real world applications of exponential and logarithmic phenomenon such as predicting population and calculating interest are solved using inverse operations.	● How are a function and its inverse function related? ● What is the relationship between an exponential and logarithmic function? ● How can we use transformations to graph and write equations for exponential and logarithmic functions? ● How can deriving a formula for a mathematical pattern assist in gathering new data? ● How do exponential functions and their graphs help us interpret events that occur in the world around us (population and calculating interest)? ● (+)How are the properties of logarithms with the same base related to the properties of exponents with the same base?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
F.BF.A1b,c	How do combinations and compositions affect the domain of the resulting function?	Add, subtract, multiply, and divide rational, radical, and polynomial functions by applying function operations. Find the composition of numerical values of functions. Find the algebraic composition of functions. Determine the domain of combined and composed functions.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use DESMOS activities and TI-84 graphing calculators as tools to investigate and discover properties and characteristics of quadratics Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets

			https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA Use color to reinforce the difference between the inner and outer function Create metaphors to describe the idea of a composition	• PARCC questions	• PARCC questions • Kahoot Games Google Forms
F.BF.4a (+)F.BF.4b	Are all inverse relations functions? Why or why not? How are inverse functions found algebraically? How are compositions used to verify functions are inverses?	Use inverse operations to find the inverse of a function algebraically. Determine if the inverse of a function is a function by applying the horizontal line test. (+) Verify functions are inverses using the composite function test.	Same as Above Inverse Function Card Game	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
F.BF.5 F.LE.4	What is the inverse of an exponential function? How are exponential functions written in logarithmic form? How are simple exponential and logarithmic equations solved? (+)How are the properties of logarithmic functions related to the properties of exponents?	Convert between exponential and logarithmic form. Solve simple exponential equations by writing them in logarithmic form. Solve simple logarithmic equations by writing them in exponential form. (+) Expand and condense logarithmic expressions using the properties of logarithms. (+) Solve logarithmic equations that require the use of properties.	Same as Above Emphasize the template for converting between exponential and logarithmic forms.	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

F.IF.B4 F.IF.C7e F.BF.3	What is the difference between the graphs of exponential growth and decay? What graphical properties do both exponential growth and exponential decay share? How is a logarithmic graph related to an exponential graph? How do the transformation rules affect the graphs of exponential and logarithmic functions?	Graph transformations of exponential functions. Write equations for transformed graphs of exponential functions. Graph transformations of logarithmic functions. Write equations for transformed graphs of logarithmic functions. (+) Determine the end behavior of exponential and logarithmic functions.	Same as Above Structured notes using template Ticket Out/Warm Up Comparing and Contrasting the graphs of exponential and logarithmic functions.	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
A.CED.1 A.CED.2 A.REI.11 A.SSE.1 A.SSE.3c A.SSE.4 F.IF.B5 F.IF.B6 F.IF.C8b F.IF.9	Given a set of data, how can you represent the data with a graphical model? How can you translate initial amounts, rate, time, and new amounts from word problems to exponential models? How can you use solving techniques to solve for the missing variable in the problem? How can you verify algebraic techniques for solving exponential equations using technology?	Interpret an exponential model through the context of a word problem. Create exponential models (growth and decay) for real world applications and use them to solve problems. Analyze exponential models using properties of exponents to determine exponential growth or decay and percent rate of change. Solve exponential word problems as a system of equations using technology to find the point of intersection. Calculate balances given a rate, principle, time, and amount of times compounded per year.	Same as Above Penny progression geometric series activity (What is a better deal: receiving a penny the first day, double the second, double the third etc. for a month or receiving one sum of one million dollars?) Use real life situations to introduce each concept	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

	What is a geometric sequence? How are geometric sequences modeled exponentially? How can you use the geometric series formula to solve word problems?	Compare and contrast linear models (using the average rate of change) to exponential models. Derive the geometric series formula. Use the geometric series formula to solve real world applications.			

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• All objectives from unit • Increase difficulty of practice problems in solving equations, graphing, and word problems • Find the inverse of rational functions • Find the inverse of functions by mentally undoing operations and writing the solution only • Compare and contrast the graphs of logarithmic functions to exponential functions. Support your information based on the fact exponentials and logarithms are inverses. • Derive the formula for geometric series	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Create own function and find its inverse. Verify a classmates' work using the composite function test. • Construct a metaphor for composing functions.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Graph exponential and logarithmic functions • Find the inverse of functions • Compose functions • Solve exponential and logarithmic equations • Set up and solve exponential word problems for missing variables	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Create own function and find its inverse. Verify a classmates' work using the composite function test. • Construct a metaphor for composing functions.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Graph exponential and logarithmic functions • Find the inverse of functions • Compose functions • Solve exponential and logarithmic equations	• Direct instruction with the teacher • Guided instructions and labeled examples • Small group instruction (when needed)	• Create own function and find its inverse. Verify a classmates' work using the composite function test. • Construct a metaphor for composing functions.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework

	• Set up and solve exponential word problems for missing variables	• Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity		• Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 7: Trigonometry -Identities and Equations

Enduring Understandings:	**Essential Questions:**
● Similar right triangles are proportional. The values of their ratios are represented by the six trigonometric functions, which are then used to solve for missing sides and angles of right triangles. ● The angle with a full circle rotation has a measure of 2π π and semi circles have a measure of π π. ● Angles on the unit circle, in standard position, represent the input for the sine and cosine functions. The resulting outputs are the coordinate points for the terminal side of that same angle. ● Functions that demonstrate periodic behavior repeat behavior over fixed intervals. ● Right triangles can be superimposed on the coordinate plane to solve trigonometric problems over any domain.	● What are the trigonometric functions and how are they used in real life? ● What are radians? When are radians more appropriate to use then degrees? ● How is the unit circle formed and what information does it contain? ● Why do some trigonometric functions have the same values? (Consider special right triangles, periodicity, identities)

Guiding / Topical Questions with Specific Standards		Content, Themes, Concepts, and Skills	Teaching Strategies	Instructional Resources and Materials	Assessment Strategies
G.SRT.C6 G.SRT.C7 G.SRT.C8	What are special right triangles and how are they derived? How can we solve for missing sides of a right triangle using pythaorean theorem and special right triangles? How are the sine cosine and tangent ratios created from similar triangles? What is the relationship between sine cosine and tangent compared to the reciprocal functions cosecant, secant and cotangent?	Derive and solve special right triangles (45, 45, 90 and 30, 60, 90). Define the six trigonometric functions in terms of right triangles. Use trigonometry to solve for missing side lengths and angles (using inverse) in a right triangle.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns Use DESMOS activities and TI-84 graphing calculators as tools to investigate and discover properties and characteristics of quadratics Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions Getting' Triggy Wit It Video: https://www.youtube.com/watch?v=t2uPYYLH4Zo	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips ● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions ● Kahoot Games Google Forms
F.TF.A1 F.TF.A2	What are the differences between angles in space compared to angles in standard position on the coordinate plane? Can two angles in the same position have	Identify and label the parts of an angle in standard position. Determine, and graph various co-terminal angles. Convert angles from degrees to radians and from radians to degrees.	Same as Above	See google docs Algebra 2 Resource Binder What is a Radian Video: https://www.wisc-online.com/learn/formal-s	See google docs Algebra 2 Resource Binder

	different angle measurements? When is it appropriate to use radians?degrees? What is the calculator default for measuring angles?	Find reference angles for any angle in standard position including angles less than zero and greater than 360. (+) Write the expression for all angles coterminal to a given angle		cience/mathematics/tmh1301/what-is-a-radian	
G.GPE.A1	How are circle equations similar and different to functions we have studied this year?	Graph a circle in standard form by determining its radius and center. Write the equation of a circle in standard form given its critical information. (+) Convert a circle equation in general form to standard form by completing the square	Same as Above	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
F.TF.A2 F.TF.A3	What are the characteristics of the unit circle? How do the special right triangles relate to the unit circle? Are there restrictions for the trigonometric functions with respect to the four quadrants?	Derive the unit circle using special right triangles and circle properties. Define the six trigonometric functions in terms of the unit circle coordinates.	Same as Above Hand trick for the coordinates in quadrant 1. Discussions regarding patterns on the unit circle.	See google docs Algebra 2 Resource Binder Deriving the Unit Circle Student-Centered Discovery Packet	See google docs Algebra 2 Resource Binder
F.TF.A3	How can we use the unit circle to find values of trigonometric ratios for any special right co-terminal angle? How does a negative angle or an angle that has extra rotations about	Determine exact values of trigonometric expressions and include the appropriate sign. Given co-terminal angles on the unit circle determine the exact value of the trigonometric expression and include the appropriate sign.	Same as Above	See google docs Algebra 2 Resource Binder : Trig Spinner Game	See google docs Algebra 2 Resource Binder

	the origin affect the trigonometric ratio?				
F.TF.A3 F.TF.A4 F.TF.C8	What makes a trigonometric function positive or negative? How is this related to the coordinate plane? How can two different expressions be equal to each other in value?	Given a coordinate point, draw the corresponding right triangle and solve all six trigonometric functions. Given a trigonometric ratio and a clue about the quadrant (ASTC), draw the corresponding right triangle and solve all six trigonometric functions. Create equivalent expressions using even and odd, co-function, and Pythagorean identities.	Same as Above Expert Jigsaw Identity Discovery	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
F.TF.B6 F.TF.B7	How are inverse trigonometric functions defined over specific domains? Why does the inverse trigonometric function only relate an answer in one quadrant?	Define the inverse trigonometric functions and (+) their respective domains.	Same as Above	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder
F.TF.B6 F.TF.B7	How can we use properties of inverse trigonometric functions and the unit circle to determine the angles that satisfy the trigonometric equations? Can there be more than one solution to trigonometric equations? What are the strategies for solving trigonometric equations?	Using properties of inverse trigonometric functions, solve sine, cosine, or tangent equations over [0, 2π) for unit circle values. (+)Six trigonometric and/or may not be unit circle values) Using algebraic properties solve the three (+six) types of trigonometric equations over [0, 2π). (+) and using algebra involving linear and quadratics – factoring, taking square roots, completing the square (+) identify solutions over a given period or for all solutions using an expression for all coterminal angles	Same as Above	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

F.TF.A4 F.TF.C8 F.TF.B7	(+) How can two different equations be equal to each other? (+) Is it possible to use the trigonometric identities to simplify equations?	(+) Use the basic trigonometric identities (reciprocal, quotient and Pythagorean) to simplify expressions. (+) Use the basic trigonometric identities to verify equations. (+) Use the basic trigonometric identities to solve equations.	Same as Above	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• Using properties of special right triangles, solve for missing values. • Determine co-terminal and reference angles for any angle in standard position. • Create and label the special right unit circle. • Evaluate trigonometric expressions and equations that fall both on and off the unit circle. • Simplify, verify and solve trigonometric equations and expressions using the basic trigonometric identities.	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given right triangles with fractions and decimals students will determine all missing values of the right triangle. • Students will determine co-terminal and reference angles that have 4 or more positive or negative rotations about the origin. • Students will evaluate trigonometric equations that require them to first find the co-terminal angle between 0 and 360. • Using algebraic properties, such as factoring, and trigonometric identities to verify, and solve expressions and equations.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Using properties of special right triangles, solve for missing values. • Determine co-terminal and reference angles for any angle in standard position. • Create and label the special right unit circle. • Evaluate trigonometric expressions and equations that fall both on and off the unit circle.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given right triangles with fractions students will determine all missing values of the right triangle. • Students will determine co-terminal and reference angles that have 3 or less positive or negative rotations about the origin. • Students will evaluate trigonometric equations for angles between 0 and 360.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology

NOT ON LEVEL YET	• Using properties of special right triangles, solve for missing values. • Determine co-terminal and reference angles for any angle in standard position. • Create and label the special right unit circle. • Evaluate trigonometric expressions and equations that fall both on and off the unit circle. •	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given right triangles with whole numbers and simple fractions students will determine all missing values of the right triangle. • Students will determine co-terminal and reference angles that have 2 or less positive or negative rotations about the origin. • Students will evaluate trigonometric equations for angles between 0 and 360.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 8: Graphing Trigonometric Equations

Enduring Understandings:	**Essential Questions:**
● Functions that demonstrate periodic behavior repeat behavior over fixed intervals. ● You can translate periodic functions in the same way you can translate the other algebraic functions. ● Sine, cosine and tangent have reciprocal functions that can also be graphed but have specific restrictions.	● How can you identify and model periodic behavior? ● How can you translate the periodicity of trigonometric functions from the unit circle or table on the x –y coordinate plane? ● How are the trigonometric functions translated? ● (+) How are the reciprocal trigonometric functions graphed? ● (+) What are the similarities and differences between the trigonometric functions and their reciprocals?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
F.TF.A4 F.TF.B5 F.IF.B4 F.IF.C7e	What is a periodic function? What are the characteristics of a periodic function? What are the recognizable patterns within the sine and cosine graph? (+) secant and cosecant	Describe the period, amplitude, and midline of any periodic function based on a graph. (+) and phase shift Describe sine, cosine, (+) secant, (+) cosecant as even, odd, or neither.	Anticipatory sets to measure background knowledge and engage students Use guided student-centered discovery packets and independent practice activities that require students to make conjectures and investigate patterns	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips	See google docs Algebra 2 Resource Binder for the following items as applicable: ● Student Centered Learning Packets ● Homework ● Do Nows ● Exit Slips

	What is the difference between the sine and cosine graph? (+) secant or cosecant (+) How are secant and cosecant related to sine and cosine? How does manipulating the amplitude, period or frequency, vertical shift and phase shift affect the corresponding graphs?	Determine the parent graph for the sine and cosine function. Recognize and explain the differences between the sine and cosine function. List the properties of the sine and cosine function in relation to the unit circle on the x and y coordinate plane. (+) Explain the relationship between the graphs of sine and cosecant and cosine and secant. Describe the trigonometric graph: sine, cosine, (+) secant, (+) cosecant based on the transformed function. Graph the trigonometric function: sine, cosine, (+) secant, (+) cosecant given a transformed equation. Write the equation of a trigonometric function based on stated criteria.	Use DESMOS activities and TI-84 graphing calculators as tools to investigate and discover properties and characteristics of quadratics Use the Mimeo, whiteboards, and worksheets to reinforce the concepts and show immediate feedback on questions Use cooperative learning activities Open-ended critical thinking PARCC-like Questions https://drive.google.com/open?id=0B1kb_-qNb-ttXzh1TUNjWURNVzA High and Low tide Intro Problem AMAMA vs. MAMAM (+) Discovery Project Desmos Slider Activity	● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions	● Assessments ● Stations/Review ● Projects ● Scavenger Hunt ● Desmos Activities ● Classwork Activities/ Worksheets ● PARCC questions ● Kahoot Games Google Forms
F.TF.A4 F.TF.B5 F.IF.B4 F.IF.C7e	What are the recognizable patterns within the tangent function? (+) cotangent How is the tangent (+) cotangent function unique in terms of its domain?	Determine the parent graph for the tangent and (+) cotangent function Describe tangent and (+)cotangent graphs as even, odd, or neither. List the properties of the tangent and (+) cotangent function in relation to the unit circle on the x and y coordinate plane. Explain the relationship between the graphs of tangent and	Same as Above	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

	How does manipulating the amplitude, period or frequency, vertical shift and phase shift affect the corresponding graphs?	(+) cotangent to sine and cosine algebraically. Describe the trigonometric graph: tangent, (+) cotangent based on the transformed function. Graph the trigonometric function: tangent and (+) cotangent given a transformed equation. Write the equation of a trigonometric function based on stated criteria.			
F.TF.A4 F.IF.B5 F.IF.C9 F.TF.B7	What critical information determines the trigonometric equation that best fits periodic behavior? If parent functions are even or odd, will the transformed functions remain even or odd?	Model real world periodic phenomenon by creating trigonometric equations based on a given scenario. Solve trigonometric equations in a real world context using graphs or algebra. (+) including linear and quadratic – factoring, taking square roots, completing the square to solve Determine if a relation is even or odd.	Same as Above Word Problems Examples – Use word problem strategies to get critical information and make a picture	See google docs Algebra 2 Resource Binder	See google docs Algebra 2 Resource Binder

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• Recognize properties of the sine, cosine, cosecant, secant, tangent and cotangent functions. • Graph the sine, cosine, cosecant, secant, tangent and cotangent parent functions. • Graph the six trigonometric functions including amplitude, period/frequency, vertical shift and phase shift. .	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given any or the six trigonometric functions, graph the function, including amplitude, period/frequency, vertical shift and phase shift. • Given a graph of any of the six trigonometric functions describe manipulation and create the equation. Including phase shift and fractions.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Recognize properties of the sine, cosine and tangent functions. • Graph the sine, cosine and tangent parent functions. • Graph the six trigonometric functions including amplitude, period/frequency, and vertical shift.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given any or the three basic trigonometric functions, graph the function, including amplitude, period/frequency, vertical shift and phase shift. • Given a graph of any of the three basic trigonometric functions describe manipulation and create the equation. Including phase shift and fractions.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Recognize properties of the sine, cosine and tangent functions. • Graph the sine, cosine and tangent parent functions. • Graph the six trigonometric functions including amplitude and vertical shift.	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given any or the three basic trigonometric functions, graph the function, including amplitude and vertical shift. • Given a graph of any of the three basic trigonometric functions describe manipulation.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material

				• Pre-teach new material (vocabulary and skills) • Incorporate technology

Suggestions on how to differentiate in this unit:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• Recognize properties of the sine, cosine, cosecant, secant, tangent and cotangent functions. • Graph the sine, cosine, cosecant, secant, tangent and cotangent parent functions. • Graph the six trigonometric functions including amplitude, period/frequency, vertical shift and phase shift. .	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given any or the six trigonometric functions, graph the function, including amplitude, period/frequency, vertical shift and phase shift. • Given a graph of any of the six trigonometric functions describe manipulation and create the equation. Including phase shift and fractions.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology
ON LEVEL	• Recognize properties of the sine, cosine and tangent functions. • Graph the sine, cosine and tangent parent functions. • Graph the six trigonometric functions including amplitude, period/frequency, and vertical shift.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given any or the three basic trigonometric functions, graph the function, including amplitude, period/frequency, vertical shift and phase shift. • Given a graph of any of the three basic trigonometric functions describe manipulation and create the equation. Including phase shift and fractions.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Recognize properties of the sine, cosine and tangent functions.	• Direct instruction with the teacher • Small group instruction (when needed)	• Given any or the three basic trigonometric functions, graph the function, including amplitude and vertical shift.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons

	• Graph the sine, cosine and tangent parent functions. • Graph the six trigonometric functions including amplitude and vertical shift.	• Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Given a graph of any of the three basic trigonometric functions describe manipulation.	• Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

Robbinsville Public Schools
Algebra 2

Unit 9: Statistical Analysis and Sampling Techniques

Enduring Understandings:	**Essential Questions:**
● Data sets can be described and compared using various statistical measures, depending on what characteristics are being studied. ● Standard deviation is a measure of how far the numbers in a data set deviate from the mean. ● The statistical information gathered from a population depends on the methods used to sample that population. ● The methods used to sample a population can cause bias and influence the results of a study, survey or experiment. ● Many real world scenarios produce data that has a normal distribution about the mean. ● Normal distribution has data that vary randomly from the mean. ● The graph of normal distribution produces a normal curve.	● How can you use statistical measures to summarize data collected from a study. ● How can standard deviation be used to describe a set of data? ● What factors are involved when determining the best method for gathering data? ● How can you determine if a sampling method has bias? ● What factors should you consider to determine if a study method is valid? ● In a normal distribution how much of the data falls within a given standard deviation? ● How can you use a normal curve to analyze data? ● How can you use standard deviation and normal distribution to determine the skewness of data?

Guiding / Topical Questions with Specific Standards	**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**

S.MD.6 S.MD.7 S.ID.4 S.IC.6	What are the most common ways to analyze and describe data? How can you determine which statistical measure to use when describing the characteristics of a data set? Are there situations where some of the statistical measures could be deemed irrelevant or unimportant? What is the significance of an outlier? How can we use the bell curve diagram to better understand data?	Calculate the measures of central tendency given a set of data. Use the central measures of tendency to make predictions about future events. Summarize a data set using the central measures of tendency. Use standard deviation and variance to determine the reliability of the central measures of tendency. Compare data summations using standard deviation. Display a data set using the normal distribution curve.	Anticipatory sets to measure background knowledge and engage students Use guided and independent practice activities Use the Mimeo, whiteboard, and worksheets to reinforce the concepts Use cooperative learning activities Use discovery based learning activities that require students to make conjectures and investigate patterns Use whiteboards to show immediate feedback on questions	Worksheets and sample problems to analyze step-by-step solutions of the problems Textbook & associated materials Teacher created worksheets Mimeo lessons Geometer's Sketchpad GeoGebra TI Smart View with TI 84 Graphing Calculators	Written tests and quizzes Worksheets Notebook assessments Response to discussion questions Anticipatory Sets/Do Now Problems Diagnostic Assessments to determine readiness Closure question/ Exit Slips
S.IC.1 S.IC.3 S.IC.4 S.IC.6	How can you use sample populations to obtain good statistical information? What are the differences between the different sampling types and methods? How can you determine which sample type and method is best? What must you consider when choosing the appropriate sample type and method?	Use the sampling methods to analyze and draw conclusions about a population. Create a situation where a sample population would be necessary. Design an experiment and or survey and use the results to make predictions about future scenarios. Determine if a sample method is statistically reliable and valid.	Same as above	Same as above	Same as above

	How can you avoid statistical bias? What factors must be considered when determining if a method is valid and reliable?				
S.ID.4	When would normal distribution model be most common or useful? How can variance and standard deviation be used to critique a set of data based on the normal distribution model? How does the concept of symmetry relate to the normal distribution model?	Use the normal distribution model to make predictions about future events based on the data. Given a set of data, display the information on under a normal distribution bell curve. Determine what percent of data falls above, below or within set intervals. Use the normal distribution model to compare statistical measures.	Same as above	Same as above	Same as above

<u>Suggestions on how to differentiate in this unit</u>:

- Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods.
- A wide variety of assessments and strategies complement the individual learning experience.

	CONTENT	PROCESS	PRODUCT	ADDITIONAL SCAFFOLDS
ENRICHMENT	• Calculate all statistical measures based on a given set of data. • Choose the best mathematical method to describe a given set of data. • Display data is the most appropriate statistical method.	• Self-guided discovery activity • Use flexible grouping to break students into collaborative learning groups • Station activity	• Design an experiment and use statistical measure to describe and summarize the data • Use the statistical measures to make predictions about future events.	• Teach with multiple intelligences in mind • Jigsaw activities • Tiered lessons • Independent study • Interest centers • Varied homework • Incorporate technology

			• Given a set of data, summarize and display the information is an organized model	
ON LEVEL	• Calculate all statistical measures based on a given set of data. • Choose the best mathematical method to describe a given set of data. • Display data is the most appropriate statistical method.	• Direct instruction at beginning of lesson, then practice independently • Use flexible grouping to break students into collaborative learning groups • Station activity	• Design an experiment and use statistical measure to describe and summarize the data • Recognize and explain the statistical measures used to describe data. • Use the statistical measures to make predictions about future events. • Given a set of data, summarize and display the information is an organized model.	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Small-group instruction • Varied homework • Interest centers • Incorporate technology
NOT ON LEVEL YET	• Calculate all statistical measures based on a given set of data. • Choose the best mathematical method to describe a given set of data. • Display data is the most appropriate statistical method.	• Direct instruction with the teacher • Small group instruction (when needed) • Additional practice in pairs or small groups • Use flexible grouping to break students into collaborative learning groups • Station activity	• Recognize and explain the statistical measures used to describe data. • Use the statistical measures to make predictions about future events. • Given a set of data, summarize and display the information is an organized model	• Teach with multiple intelligences in mind • Anchor activities • Tiered lessons • Varied questions • Varied homework • Interest centers • Anticipation guides • Guided notes • Chunk material • Pre-teach new material (vocabulary and skills) • Incorporate technology

** All Standards are from the Common Core State Standards and can be accessed by visiting http://www.corestandards.org/the-standards/mathematics*

Textbook

Lial, M., & Hornsby, J. (2011). *Algebra and Trigonometry*. Boston, MA: Addison-Wesley, Pearson.

Resources

GeoGebra Tube: http://www.GeoGebratube.org/?lang=en
Geometer's Sketchpad: http://www.dynamicgeometry.com/
SMART Exchange: http://exchange.smarttech.com/search.html
NCTM Illuminations: http://illuminations.nctm.org/
MathBits: http://mathbits.com/MathBits/TeacherResources/Geometry/Geometry.htm
New York Regents Prep Center: http://mathbits.com/MathBits/TeacherResources/Geometry/Geometry.htm