<u>Algebra II Honors</u> <u>Elective</u> Sayreville War Memorial High School <u>5 Credits</u> <u>Full Year</u>

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## Sayreville Public Schools Algebra II Honors – 5 Credits

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## Statement of Purpose

## **Summary of the Course:**

This course is a fast-paced extension of Algebra 1, with a very limited review of Algebra 1 key concepts. After a brief review of linear functions and systems of linear equations, students will continue their study of quadratic functions, polynomials and polynomial functions, rational exponents and radical functions, and rational functions. Students will then be introduced to exponential and logarithmic functions, parabolas (from the conic section point of view), trigonometric ratios, trigonometric functions and their graphs, sequences and series, probability, and data analysis and statistics. As time permits, students will continue their study of conic sections and advanced topics in trigonometry. Applications of mathematics through a study of word problems are emphasized many times throughout the course. Assignments will include more challenging problems that in the non-honors course. The use of graphing calculators will be emphasized and mandatory.

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

- The use of various formative assessments are encouraged in order to provide an ongoing method of determining the current level of understanding the students have of the material presented.
- Homework, when assigned should be relevant and reflective of the current teaching taking place in the classroom.
- Organizational strategies should be in place that allow the students the ability to take the information gained in the classroom and put in interms that are relevant to them.
- Instruction should be differentiated to allow students the best opportunity to learn.
- Assessments should be varied and assess topics of instruction delivered in class.
- Modifications to the curriculum should be included that address students with Individualized Educational Plans (IEP), English Language Learners (ELL), and those requiring other modifications (504 plans).

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## Unit P: Linear Functions, Systems of Equations and Inequalities

**Summary of the Unit:** In this unit, students will be able to analyze graphs of relations and functions, determine if relations are functions, use function notation, and write and graph linear equations. Students will be able to find and interpret the meaning of the slope of a line in order to solve real-world problems. Students will be able to identify and graph special functions, including constant, identity, absolute value, step and piece-wise functions. Students will be able to solve systems of linear equations graphically or algebraically, and interpret the meaning of the point of intersection. Students will extend their study to include the finding the point of intersection of three planes.

**Enduring Understanding:** Relations and functions can be represented numerically, graphically, algebraically, and/or verbally. Functions can be identified using a variety of techniques, including the Vertical Line Test. There are many forms of linear equations, and the most useful form depends on what you are trying to accomplish (i.e., graph, or find intercepts). The slope of a line indicate the rate of change of vertical units over horizontal units. The solution to a linear system of equations represents the point of intersection of the two lines, and has meaning based on the context of the original question.

**Essential Questions:** Why are relations and functions represented in different ways? How can you determine if a relation is a function? How do you write the equation of a line? What techniques can you use to solve a system of linear equations? What does the solution to a system of linear equations represent?

Summative Assessm	ient and/ or Summati	ve Criteria to demon	strate mastery of the	Unit.	
Section Quizzes, End	l of Unit Tests, and End	d of Quarter Exam			
<b>Resources: Glencoe</b>	Algebra 2 New Jersey	y Edition (©2005) and	d New Jersey Student	Learning Standards	
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning
				Assessments	Standards
Relations and	1 day	Analyze graphs of	Present relations	Check student	HS A.CED.A.2
Functions		relations and	and functions in	responses.	HS A.REI.D.10
		functions.	multiple		HS F.IF.A.1
			representations, and	Quick thumbs	HS F.IF.A.2
		Determine if a	use the definition of	up/down whether a	HS F.IF.C.7a
		relation is a	function or the	relation is a	ELA-
		function.	Vertical Line Test	function.	LITERACY.RST.9-
			to determine is a		10.4

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		Find functional	relation is a	Assess	
		values.	function.	understanding of	
				functional notation	
		Write linear	Introduce function	via oral	
		equations in	notation and how to	participation.	
		standard form.	use it. Indicate that		
			f(x) is not the only	Circulate to check	
		Graph a linear	way to write	student equations.	
		function using	function notation	_	
		intercepts.	(i.e. $g(a), C(d),$	Check student	
		-	A(r)	graphs.	
			Model writing	Classwork	
			linear equations in	assigned.	
			standard form.		
				Homework	
			Graph a linear	assigned.	
			equation using the	-	
			intercepts method		
			form the above		
			form.		
Slope	1 day	Find and use the	Provide slope	Assess student	HS F.LE.A.1a
		slope of a line.	formula, if students	recall of these	HS F.LE.A.1b
			cannot recall it.	Algebra 1 topics,	ELA-
		Graph parallel and		and review where	LITERACY.RST.9-
		perpendicular lines.	Indicate that slope	needed.	10.5
			is a rate of change.		
		Determine if two		Check student	
		lines are parallel,	Remind students of	responses.	
		perpendicular, or	what makes lines		
		neither.	parallel,	Classwork	
			perpendicular, or	assigned.	
			neither, if they		
			cannot recall.	Homework	
				assigned.	

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		Algebra II Hor	ors – 5 Credits	I	
Write Equations of	1 day	Write equations of	Provide students	Assess student	HS A.CED.A.2
Lines and Graph		lines given a slope	with examples of	recall of these	HS A.REI.D.12
Linear Inequalities		and y-intercept, a	each type of	Algebra 1 topics,	HS F.LE.A.2
		point and a slope,	problem, and tips	and review where	ELA-
		or two points.	on where to start.	needed.	LITERACY.RST.9-
			Include examples		10.5
		Graph linear	that are word	Check student	
		inequalities (and	problems.	responses.	
		determine whether	-	-	
		the line is dashed or	Remind students	Check student	
		solid, and which	how to decide if a	graphs.	
		half-plane to	line is dashed or		
		shade).	solid, and how to	Classwork	
		,	determine which	assigned.	
			half-plane to shade		
			in a system of	Homework	
			inequalities, if they	assigned.	
			cannot recall.		
Graphs of Special	1.5 days	Identify and graph	Remind students of	Assess student	HS A.REI.D.10
Functions		constant, identity,	what a constant	recall of these	HS F.IF.C.7b
		absolute value.	function is, if they	Algebra 1 topics.	HS F.BF.B.3
		step, and piece-wise	cannot recall.	and review where	ELA-
		defined functions.		needed.	LITERACY.RST.9-
			Define identity		10.4
			function, and	Check student	
			indicate that it is	responses.	
			<i>the</i> function with	r	
			slope=1 and v-	Check student	
			intercept of $0 - it$	graphs.	
			does not change.	6 T	
				Check for correct	
			Provide directions	use of graphing	
			on locating the	calculator.	
			vertex of an	• • • • • • • • • • • • • • • • • • • •	
			absolute value		

		Algebra II Hoi	<u>iors – 5 Credits</u>		
			graph, and	Classwork	
			constructing a table	assigned.	
			of values centered		
			about that vertex.	Homework	
				assigned.	
			Show how to graph	C	
			a piece-wise		
			defined function a		
			variety of ways,		
			based on student		
			understanding (for		
			example, using		
			tables, graphing by		
			hand and then		
			erasing, what is not		
			needed, or graphing		
			calculator).		
Review and Test of	1.5 days	Review preliminary	Provide sample	Circulate during	HS A.CED.A.2
Preliminary Topics		topics covered up	review questions,	review to assess	HS A.REI.D.10
		until this point.	and provide time	student	HS A.REI.D.12
		-	for individual work	understanding.	HS F.IF.C.7b
		Assess student	and group		HS F.BF.B.3
		understanding of	discussion, during	Assessment to last	HS F.LE.A.2
		preliminary topics.	<sup>1</sup> / <sub>2</sub> -day review.	all period.	ELA-
					LITERACY.RST.9-
			Assessment to last		10.4
			all period.		
Systems of Two	2 days	Given a system of	Review each	Assess student	HS A.CED.A.3
Linear Equations		linear equations in	technique and the	recall of this	HS A.REI.C.5
and Inequalities in		two variables,	importance of the	Algebra 1 topic,	HS A.REI.C.6
Two Variables		approximate	"check".	and review as	HS A.REI.D.11
		solutions		needed.	HS A.REI.D.12
		graphically and	Show how to use		ELA-
		confirm	the graphing	Check student	LITERACY.RST.9-
		algebraically.	calculator the find	responses.	10.7

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	the solution to a		
Solve systems by	system of	Check student	
substitution or	equations.	graphs.	
elimination.			
	Review what "no	Check for correct	
Graph a system of	solution" or	use of graphing	
linear inequalities	"infinitely many"	calculator.	
(determine whether	solutions looks like		
the line is dashed or	and means.	Check translations	
solid, and shade the		of word problems	
correct half-planes	Relate graphing a	into algebra.	
lightly, and shade	system of		
the solution set	inequalities back to	Classwork	
dark).	graphing just one	assigned.	
	linear inequality.		
Solve systems of		Homework	
two equations in	Show how to use	assigned.	
two variables that	the graphing		
involve word	calculator to		
problems.	confirm the		
	solutions to a		
	system of		
	inequalities.		
	1		
	Provide multiple		
	examples of word		
	problems involving		
	systems, such as		
	number, money,		
	geometry and age		
	problems. Review		
	common errors in		
	translating word		
	problems into		
	algebra.		

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Systems of Three	2 days	Given a system of	Show simple	Classwork	HS A.CED.A.3
Equations in Three		three equations in	systems (such as	assigned.	ELA-
Variables.		three variables,	triangular systems),		LITERACY.RST.9-
		solve by	and move up to	Homework	10.7
		elimination, and	move complicated	assigned.	
		check.	systems.		
				Students can craft	
				their own word	
				problem that needs	
				a 3x3 system to	
				solve, and can	
				submit work for a	
				quiz grade.	
Suggested Modificat	tions for Special Edu	cation, English Langu	age Learners and Gi	fted Students:	
Students will be allow	wed to submit assignm	ents using additional ti	me per IEP modification	ons.	
Students will be enco	ouraged to use different	t size and type of font i	n order to avoid print	confusion.	
LEP students will be	allowed to use an inter	rnet translator or langu	age glossary in order to	o translate vocabulary	and assignments
properly.					
LEP students may be	allowed to work with	another student who is	fluent in their native l	anguage.	
Suggested Technolo	gical Innovations/Use	<b>)</b> •			
Instructional technology	ogy, where available, s	hould be used to present	nt and assess lessons s	uch as; PowerPoint, SN	MART Board, Quia,
Kahoot, etc. Teacher	s are encouraged to us	e electronic assessmen	ts to determine master	y of concepts taught.	
Demonstration of the	graphing calculator, a	nd student use of the g	raphing calculator sho	uld be mandatory.	
Cross Curricular/ 2	1 <sup>st</sup> Century Connection	ons:			
9.1 21st Century Life	e and Career Skills: A	All students will dem	onstrate the creative	e, critical thinking, co	llaboration, and
problem-solving sk	tills needed to function	on successfully as bo	th global citizens an	d workers in diverse	ethnic and
organizational cult	ires	J	0		
92 21 <sup>st</sup> Century Life	e and Career Skills <sup>.</sup> I	Personal Financial Lif	eracy: All students y	will develop skills an	d strategies that
promote personal and financial responsibility related to financial planning, sayings, investment, and charitable giving					
in the global economy.					
93 21 <sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply					
knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the					
globally competitive work environment of the information age					
0 - 3 j <b>r • • • •</b> •			0		

#### Sayreville Public Schools Algebra II Honors – 5 Credits Unit 1: Quadratic Functions and Factoring

**Summary of the Unit:** In this unit, students will learn how to graph quadratic functions written in standard form, vertex form, or intercept form, how to graph quadratic inequalities, and how to use the graph of a quadratic inequality to solve it. Students will learn how to factor binomials and trinomials and learn how to solve quadratic equations by factoring, finding square roots, completing the square, and using the quadratic formula. Students will learn how to use properties of radicals, how to simplify radicals, and how to calculate with the imaginary unit *i* and perform operations with complex numbers.

**Enduring Understanding:** Quadratic functions may be represented in a variety of forms (standard form, vertex form, or intercept form), and can be graphed in different ways based on the given form. Quadratic functions can be solved using a variety of techniques (factoring, finding square roots, completing the square, or using the quadratic formula), and the technique chosen comes after analyzing the function and thinking about the best course of action. Solving quadratic functions may produce complex solutions, and operations may be performed on complex numbers.

**Essential Questions:** How do you graph and write quadratic functions in several forms? What are the methods for solving quadratic functions? How do you perform operations with square roots and complex numbers?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit.					
Section Quizzes, End	l of Unit Tests, and Er	nd of Quarter Exam			
Resources: Larson	Algebra 2 Common (	Core Edition (©2012)	and New Jersey Stude	ent Learning Standar	·ds
<b>Topic/ Selection</b>	Suggested	<b>General Objectives</b>	Instructional	Suggested	New Jersey
	Timeline per topic		Activities	Benchmarks/	Student Learning
				Assessments	Standards
Graph Quadratic	2 days	Graph a quadratic in	Graph $\mathbb{I} = \mathbb{I}^2$ , the	Check student	HS A.CED.1
Functions in		standard form	"parent"	responses.	HS A.REI.10
Standard Form		correctly.	quadratic		HS F.IF.4
			function.	Check student	HS F.IF.7a
		Identify the axis of		graphs.	
		symmetry, vertex,	Define the standard		
		and solutions, if	form of a quadratic	Check for correct	
		possible.	function $22 = 2222^2$	use of graphing	
			+	calculator.	
		Find the minimum	2222+22.		
		or maximum value			

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		of a quadratic	meaning of vertex,	Check translations			
		function by hand or	minimum/maximum,	of word problems			
		by using the	and axis of	into algebra.			
		graphing calculator.	symmetry.				
				Classwork			
		Create a quadratic	Use the graphing	assigned.			
		function in order to	calculator to explore				
		solve a	what changes in <i>a</i> , <i>b</i> ,	Homework			
		minimum/maximum	or <i>c</i> do to the graph.	assigned.			
		word problem.	Discuss what makes				
			a parabola open up				
			vs open down.				
			Provide notes on the				
			equation of the axis				
			of symmetry, the y-				
			intercept, and				
			solutions (x-				
			intercepts).				
			Practice making				
			graphs of quadratics				
			using a hand-				
			generated table of				
			values, then use the				
			graphing calculator.				
			Model creating a				
			quadratic function to				
			solve a				
			minimum/maximum				
			word problem.				
Graph Quadratic	2 days	Graph quadratic	Introduce vertex	Check student	HS A.SSE.3a		
Functions in		functions in vertex	form $22 = 22(22 - 1)$	responses.	HS F.IF.4		
		or intercept form.	<i>h</i> ) <sup>2</sup> + <i>kk</i> . Make		HS F.IF.7a		

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Vertex or Intercept		changes in <i>a</i> , <i>h</i> , and	Check student	HS F.BF.3		
Form	Convert a quadratic	k using the graphing	graphs.	ELA-		
	function in vertex or	calculator, and have		LITERACY.RST.9-		
	intercept form to	students predict	Check for correct	10.5		
	standard form using	what will happen to	use of graphing			
	the distributive	the graph.	calculator.			
	property.					
		Formalize discussion	Check translations			
		on how to find the	of word problems			
		vertex, and how to	into algebra.			
		create a table of	8			
		values that includes	Circulate to spot			
		the vertex, in order	check converting to			
		to sketch the graph.	standard form			
		to shoton the gruph.	Stundard Torrin			
		Introduce intercept	Classwork			
		form $\overline{P} = \overline{P} \overline{P} \overline{P} -$	assigned			
		[00](00 00) The r	ussigned.			
		$\frac{100}{100} = \frac{100}{100}$ . The $x$ -	Homework			
		and a and the avia	assigned			
		and $q$ , and the axis	assigned.			
		of symmetry will				
		$\mathbb{C}\mathbb{C} = (\mathbb{C}\mathbb{C} + \mathbb{C}\mathbb{C})/2.$				
		Explore word				
		problems such as				
		finding the distance				
		a tootball is kicked,				
		and its maximum				
		height, given an				
		equations that				
		models its path.				
		Practice converting				

		Algebra II Ho	nors – 5 Credits		
Solve $x^2 + bx + c = 0$	1 day	Solve quadratic	Revisit the words:	Assess student	HS A.SSE.3a
by Factoring		functions (where	"zeros", "roots",	recall of this	HS A.CED.1
		<i>a</i> =1) by factoring,	"solutions" and "x-	Algebra 1 topic,	HS F.IF.8
		then using the Zero	intercepts" (if real),	and review as	
		Product Property.	all mean the same	needed.	
			thing.		
				Check student	
			Review the Zero	responses.	
			Product Property.		
				Check for correct	
			Model solving	use of graphing	
			problems of this	calculator.	
			type, and show how		
			to "check" by hand	Check translations	
			or with the graphing	of word problems	
			calculator.	into algebra.	
			Model a word	Classwork	
			problem that can be	assigned.	
			solved using this		
			technique.	Homework	
				assigned.	
Solve	2 days	Solve quadratic	Review all factoring	Assess student	HS A.SSE.1
$ax^2 + bx + c = 0$ by		functions (where a	techniques (GCF,	recall of this	HS A.SSE.3a
Factoring		$\neq$ 1) by factoring,	difference of	Algebra 1 topic,	HS A.CED.1
		then using the Zero	squares, perfect	and review as	HS F.IF.8
		Product Property.	square trinomials,	needed.	
			trinomials of any		
			type, grouping, etc.).	Check student	
				responses.	
			Practice solving		
			problems that can	Check translations	
			use the above	of word problems	
			techniques.	into algebra.	

		Algebra II Ho	onors – 5 Credits		
			Include word	Classwork	
			problems that can be	assigned.	
			solved using these	-	
			techniques.	Homework	
				assigned.	
Solve Quadratic	1 day	Review simplifying	Review vocabulary	Assess student	HS A.REI.1
Equations by	-	radicals.	of radicals: square	recall of this	HS A.REI.4b
Finding Square			root, principal	Algebra 1 topic,	HS A.REI.10
Roots		Solve quadratics by	square root, radical,	and review as	HS F.IF.4
		taking square roots.	radical sign,	needed.	
			radicand, index,		
			"simplified radical",	Check student	
			rationalizing the	responses.	
			denominator and	1	
			conjugates.	Check translations	
			5.6	of word problems	
			Identify when the	into algebra.	
			square root	e	
			technique will be	Classwork	
			able to be used.	assigned.	
				8	
			Remind students of	Homework	
			the Fundamental	assigned.	
			Theorem of Algebra.	8	
			and that in a		
			quadratic, they must		
			account for the two		
			solutions (which		
			may not be unique)		
			Model word		
			problems, including		
			the height of a		
			dropped object.		

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Review and Assess Graphing and Solving Quadratics	3 days	Review all graphing techniques. Review all solving techniques explored up to this point. Assess student understanding of graphing and solving quadratics	Provide review problems on graphing and solving quadratics. Assessment to last all period.	Circulate during review to assist students. Assessment to last all period.	HS SSE.3a HS CED.A1 HS F.IF.4 HS F.IF.7a HS A.REI.1 HS A.REI.4b HS A.REI.10 ELA- LITERACY.RST.9- 10.5
Perform Operations with Complex Numbers	3 days	Solve quadratic functions with imaginary solutions. Perform operations on complex numbers.	Discuss properties of imaginary numbers. Provide examples of quadratics that have imaginary solutions. Show how to perform operations on complex numbers, and relate this back to how operations with radical were performed. As time permits, explore graphing complex numbers in the complex plane.	Check student responses. Classwork assigned. Homework assigned. Quiz.	HS N.CN.1 HS N.CN.2 HS N.CN.3 HS N.CN.4 HS N.CN.7 ELA- LITERACY.RST.9- 10.4
Complete the Square	2 days	Solve quadratic functions by completing the square.	Provide details in the process of completing the	Assess student understanding via oral participation.	HS N.CN.7 HS A.SSE.1a HS A.SSE.3b HS A.REI.4a

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			square (both when	Circulate to assist	HS A.REI.4b			
		Convert a quadratic	$a=1$ and when $a\neq 1$ ).	students as needed.	HS F.IF.8a			
		function in standard						
		form to vertex form	Model practice	Classwork				
		using completing	problems of both	assigned.				
		the square.	types.					
				Homework				
			Model practice	assigned.				
			problems of					
			converting a					
			quadratic function in					
			standard form to					
			vertex form using					
			this process.					
			Include word					
			problems that can be					
			solved using this					
			technique.					
Use the Quadratic	1 day	Solve quadratics	Derive the quadratic	Check student	HS N.CN.7			
Formula and the		using the quadratic	formula by	responses.	HS A.REI.4a			
Discriminant		formula.	completing the		HS A.REI.4b			
			square.	Check for correct	HS F.IF.4			
		Use the		use of graphing	HS F.IF.5			
		discriminant to	Model solving	calculator.	ELA-			
		determine the type	quadratics using the		LITERACY.RST.9-			
		of solutions there	quadratic formula on	Check translations	10.4			
		will be.	4 problems that give	of word problems				
			the 4 possible	into algebra.				
			outcomes (2					
			complex solutions, 1	Classwork				
			real rational double	assigned.				
			root, 2 real rational					
			roots, and 2 real	Homework				
			irrational roots).	assigned.				

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			Leave these on the		
			board.		
			Discuss the		
			discriminant and that		
			its using on and ist		
			its value can predict		
			the types of		
			solutions there will		
			be. Use the		
			problems above to		
			direct the discussion.		
			Include word		
			problems that can be		
			solved using the		
			aughteric formula		
			quadratic formula.		
			Remind students that		
			the graphing		
			calculator can be		
			vand to do shools		
	0.1				
Graph and Solve	2 days	Solve a quadratic	Review simple	Check student	HS A.SSE.3a
Quadratic		inequality first by	"and" and "or"	responses.	HS A.CED.I
Inequalities		solving for the roots	inequalities and the		HS A.CED.3
		using any	rules of conjunction	Check student	HS A.REI.4b
		technique, then	and disjunction.	graphs.	HS F.IF.4
		using a sign graph			HS F.IF.5
		to help determine	Show process of	Check for correct	
		the solution set.	solving quadratic	use of graphing	
			inequalities	calculator.	
			algebraically (sign		
			graph) and/or	Classwork	
			graphically (using	assigned.	
			test points) Remind		
			students that		
			students that		

Algebra II Honors – 5 Credits						
		_	boundary line acts	Homework		
			the same ways a	assigned.		
			linear inequalities.			
			Remind students that			
			the graphing			
			calculator can be			
			used to do this.			
Review and Assess	2 days	Review complex	Provide review	Circulate during	HS N.CN.7	
Complex Numbers,		numbers,	problems on	review to assist	HS A.SSE.3b	
Completing the		completing the	complex numbers,	students.	HS A.CED.1	
Square and the		square, the	completing the		HS A.REI.4a	
Quadratic Formula		quadratic formula,	square, the quadratic	Assessment to last	HS A.REI.4b	
		the discriminant,	formula, the	all period.	HS F.IF.8a	
		and solving	discriminant, and	1	ELA-	
		quadratic	solving quadratic		LITERACY.RST.9-	
		inequalities.	inequalities.		10.4	
		1	1			
		Assess student	Assessment to last			
		understanding of	all period.			
		above topics.	1			
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Gif	fted Students:		
Students will be allo	wed to submit assignn	nents using additional t	ime per IEP modification	ons.		
Students will be enco	ouraged to use differen	nt size and type of font	in order to avoid print c	confusion.		
LEP students will be	e allowed to use an inte	ernet translator or langu	age glossary in order to	translate vocabulary	and assignments	
properly.						
LEP students may be	e allowed to work with	another student who i	s fluent in their native la	anguage.		
Suggested Technolo	ogical Innovations/ U	se:				
Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia,						
Kahoot, etc.						
Teachers are encoura	aged to use electronic	assessments to determi	ne mastery of concepts	taught.		
Demonstration of the	e graphing calculator,	and student use of the g	graphing calculator shou	ald be mandatory.		
Cross Curricular/ 2	21st Century Connecti	ions:				

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9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

#### Sayreville Public Schools Algebra II Honors – 5 Credits Unit 2: Polynomials and Polynomial Functions

**Summary of the Unit:** In this unit, students learn and apply properties of exponents as they simplify expressions involving powers and add, subtract, and multiply polynomials. They learn methods to factor and solve polynomial equations, including the Remainder and Factor Theorems. Using intercepts and other methods, they graph polynomial functions, classify the zeros of the function, and find all real zeros.

**Enduring Understanding:** Operations may be performed on polynomials. The graph of a polynomial can be used to find real zeros, describe end behavior, locate turning points, and indicate where a graph is increasing, decreasing, or constant. Polynomial functions can be evaluated by direct substitution, or by the Remainder Theorem. The Factor Theorem can use to quickly determine whether a given *x*-value is a zero of the function.

**Essential Questions:** How do you graph polynomial functions? What operations can be performed on polynomials? How do you find the zeros of a polynomial equation?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

<b>Resources:</b> Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards							
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey		
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning		
				Assessments	Standards		
Use Properties of	2 days	Simplify	Review properties	Assess student	HS N.RN.1		
Exponents		expressions using	of exponents and	recall of these	ELA-		
		properties of	provide sample	Algebra 1 topics,	LITERACY.RST.9-		
		exponents.	problems of	and review where	10.4		
			increasing level of	needed.			
		As time permits,	difficulty.				
		review scientific		Check student			
		notation.	Include a word	responses.			
			problem using				
			scientific notation,	Classwork			
			as time permits.	assigned.			
				Homework			
				assigned.			

Algebra II Honors – 5 Credits						
Evaluate and Graph	2 days	Understand and use	Review vocabulary:	Check student	HS F.IF.4	
Polynomial		polynomial	polynomial,	understanding via	HS F.IF.7c	
Functions		function notation.	descending degree,	oral participation.	ELA-	
			leading coefficient,		LITERACY.RST.9-	
		Evaluate	constant.	Check student work	10.4	
		polynomial		and graphs.		
		functions by direct	Review process of			
		substitution or	direct substitution,	Check for correct		
		synthetic	and show the	use of graphing		
		substitution.	process of synthetic	calculator.		
			substitution – both			
		Discuss end	result in the same	Classwork		
		behavior of	value.	assigned.		
		polynomial		-		
		functions (based on	Discuss end	Homework		
		degree and leading	behavior of	assigned.		
		coefficient).	polynomial	-		
			functions (based on			
		Graph a polynomial	degree and leading			
		function using a	coefficient).			
		table of values and				
		knowledge of end	Review the use of			
		behaviors.	the graphing			
			calculator. Have			
			students predict end			
			behaviors of a			
			polynomial			
			function, then			
			confirm it in the			
			graphing calculator.			
Add, Subtract, &	2 days	Add, subtract, and	Review how to add,	Assess student	HS A.SSE.2	
Multiply		multiply	subtract, and	recall of these	HS A.APR.1	
Polynomials		polynomials.	multiply	Algebra 1 topics,	HS A.APR.4	
			polynomials,	and review where	HS F.BF.1b	
			including special	needed.		

	1	Algebra II Ho	nors – 5 Credits	1	
			products, as time		
			permits.	Check student	
			-	responses.	
			Include word	_	
			problems that can be	Classwork	
			solved using	assigned.	
			operations on	8	
			polynomials	Homework	
			porynomiais.	assigned	
				assigned.	
				*Overtarly 1	
				Accompant	
				Assessment	
<b>E</b> ( 101	2 darsa			material ends here.	
Factor and Solve	2 days	Factor and solve	Review all factoring	Assess student	HS A.SSE.2
Polynomial		polynomial	techniques, and	understanding of	HS A.SSE.3
Equations		equations.	introduce	new factoring	HS A.APR.3
			sum/difference of	pattern.	HS A.APR.4
			cubes pattern.		HS A.CED.1
				Classwork	
			Review Zero	assigned.	
			Product Property,		
			and its use in	Homework	
			solving polynomial	assigned.	
			equations		
			equations.		
			Remind students to		
			"check"		
Poviou and Assass	2 days	Poviow all graphing	Drovido roviow	Circulate during	USNDN1
Droportion of	2 days	toobniquos	nrohlams on	roviou to assist	
Floperties of		techniques.	problems of	students	$\begin{array}{c} ID A.SSE.2 \\ IID A SSE.2 \end{array}$
Exponents,		Deview and the	properties of	students.	
Evaluating and		Keview properties	exponents,	A	ПЭ А.АРК.I
Graphing		or exponents,	evaluating and	Assessment to last	HS A.APK.3
Polynomial		evaluating and	graphing polynomial	all period.	HS A.APR.4
Functions,		graphing	functions,		HS A.CED.1
Operations on		polynomial	operations on		HS F.BF.1b

	Algebra II Honors – 5 Credits						
Polynomials, and Factoring Polynomials.		functions, operations on polynomials, and factoring polynomials. Assess student understanding of above topics	polynomials, and factoring polynomials. Assessment to last all period.		ELA- LITERACY.RST.9- 10.4		
Apply the Remainder and Factor Theorems	2 days	Divide polynomials using long or synthetic division. Factor polynomials using synthetic division.	Review the steps on long division using an arithmetic problem first, then show that the steps are similar in polynomial long division. Show how to "check" by hand. Provide notes on when and how to use synthetic division. Show that it gets the same answer as long division. Revisit synthetic substitution, and relate it to the Remainder Theorem. Remind students what "goes in	Circulate to assess student understanding of new division process, and of the two new theorems. Classwork assigned. Homework assigned.	HS A.SSE.2 HS A.SSE.3 HS A.APR.2 HS A.APR.3 HS A.APR.6 ELA- LITERACY.RST.9- 10.4		

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		Algebra II Ho	nors – 5 Credits evenly" means, and how that relates to the Factor Theorem. Include word problems that can be solved using long or synthetic division, or the Remainder		
Find Rational Zeros	1 day	Find rational zeros using the Rational Zero Theorem.	Theorems. Introduce the Rational Zero Theorem, and use it to make a list of possible zeros. Then, test the possible zeros to see which of them truly are zeros. (Use a graphing calculator to narrow the list.) Once one is found, the lower-degree polynomial function can be used or solved, if it is a quadratic.	Circulate to assess student understanding of new theorem. Classwork assigned. Homework assigned.	HS N.CN.7 HS A.APR.2 HS A.APR.3 HS A.CED.1 ELA- LITERACY.RST.9- 10.5
Apply the Fundamental Theorem of Algebra	2 days	Use the Fundamental Theorem of Algebra to determine the number of solutions	Reintroduce the Fundamental Theorem of Algebra (used to determine the number of solutions that need	Circulate to assess student understanding of new theorems.	HS N.CN.7 HS N.CN.9 HS A.APR.3 HS F.IF.7c

Algebra II Honors – 5 Credits								
		that need to be	to be accounted for	Classwork				
		accounted for.	- solutions may be	assigned.				
			repeated).	-				
		Use the Complex		Homework				
		Conjugate and	Give solutions to a	assigned.				
		Irrational Conjugate	polynomial	-				
		Theorems to	function, and					
		identify other	discuss how to make					
		solutions.	a polynomial					
			function that has					
		Use Descartes'	those solutions.					
		Rule of Signs to						
		determine the	Use the Complex					
		number of possible	Conjugate and					
		positive and	Irrational Conjugate					
		possible negative	Theorems to					
		real zeros.	identify other					
		(Confirm what is	solutions, and repeat					
		correct on the	the above exercise.					
		graphing						
		calculator.)	Provide notes on					
			how to use					
			Descartes' Rule of					
			Signs to determine					
			the number of					
			possible positive					
			and possible					
			negative real zeros.					
			Create a chart to					
			organize the					
			information. (Show					
			how to confirm what					
			is correct on the					
			graphing calculator.)					

Algebra II Honors – 5 Credits							
Analyze Graphs of	1 day	Use knowledge of	Use knowledge of <i>x</i> -	Check student	HS N.CN.9		
Polynomial		<i>x</i> -intercepts and end	intercepts and end	understanding via	HS A.APR.3		
Functions		behavior to graph a	behavior to graph a	oral participation.	HS A.CED.2		
		polynomial	polynomial		HS F.IF.4		
		function.	function, using an	Check student work	HS F.IF.7c		
			example where you	and graphs.	ELA-		
			can tell what the		LITERACY.RST.9-		
			zeros are by looking	Check for correct	10.5		
			at the equation.	use of graphing			
			(Create a table using	calculator.			
			those zeros, plus				
			some <i>x</i> -values on	Classwork			
			the ends, and some	assigned.			
			<i>x</i> -values in between.				
			Make she the picture	Homework			
			matches what you	assigned.			
			think should happen.				
			Review the concept				
			of turning points and				
			the max number of				
			turning points a				
			graph could have.				
			Explore increasing,				
			decreasing, and				
			constant intervals, as				
			time permits.				
Review and Assess	2 days	Review Remainder	Provide review	Circulate during	HS N.CN.9		
Remainder and		and Factor	problems on	review to assist	HS A.APR.2		
Factor Theorems,		Theorems, finding	Remainder and	students.	HS A.APR.3		
Finding Rational		rational zeros,	Factor Theorems,		HS A.CED.2		
Zeros,		Fundamental	finding rational	Assessment to last	HS F.IF.4		
Fundamental		Theorem of	zeros, Fundamental	all period.	HS F.IF.7c		
Theorem of		Algebra, and	Theorem of				

Algebra II Honors 5 Credits							
Algebra, and		analyzing graphs of	Algebra, and		ELA-		
Analyzing Graphs		polynomial	analyzing graphs of		LITERACY.RST.9-		
of Polynomial		functions.	polynomial		10.4		
Functions			functions.				
		Assess student					
		understanding of	Assessment to last				
		above topics.	all period.				
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Gi	fted Students:			
Students will be allow	wed to submit assignm	ents using additional t	ime per IEP modification	ons.			
Students will be enco	uraged to use differen	t size and type of font	in order to avoid print of	confusion.			
LEP students will be	allowed to use an inte	rnet translator or langu	age glossary in order to	o translate vocabulary	and assignments		
properly.							
LEP students may be	allowed to work with	another student who is	s fluent in their native l	anguage.			
Suggested Technolo	Suggested Technological Innovations/ Use:						
Instructional technolo	ogy, where available, s	should be used to prese	ent and assess lessons su	uch as; PowerPoint, SN	MART Board, Quia,		
Kahoot, etc.							
Teachers are encoura	ged to use electronic a	assessments to determine	ne mastery of concepts	taught.			
Demonstration of the	graphing calculator, a	and student use of the g	graphing calculator show	uld be mandatory.			
Cross Curricular/ 2	1 <sup>st</sup> Century Connection	ons:					
9.1 21 <sup>st</sup> Century Life	e and Career Skills: A	All students will den	nonstrate the creative	, critical thinking, co	llaboration, and		
problem-solving sk	ills needed to functi	on successfully as bo	oth global citizens and	d workers in diverse	ethnic and		
organizational cult	ures.						
9.2 21st Century Life	e and Career Skills: I	Personal Financial Li	teracy: All students w	vill develop skills an	d strategies that		
promote personal a	nd financial respons	sibility related to fina	ancial planning, savir	ngs, investment, and	charitable giving		
in the global econor	my.	5	1 0	0	0 0		
9.3 21 <sup>st</sup> Century Life	e and Career Skills: (	Career Awareness, E	xploration, and Prep	aration: All students	will apply		
knowledge about a	nd engage in the pro	ocess of career aware	eness, exploration. an	d preparation in ord	er to navigate the		
globally competitiv	e work environmen	t of the information a	age.	1 1 1 1 1 1 1 1 1 1	0		

#### Sayreville Public Schools Algebra II Honors – 5 Credits Unit 3: Rational Exponents and Radical Functions

**Summary of the Unit:** First, students will learn the meaning of  $n^{\text{th}}$  roots and rational exponent notation, and how to apply the properties of rational exponents. Next, they will learn to perform function operations, including composition. Then, they will learn how to determine whether a given function has an inverse that is also a function. Finally, students will learn to graph square root and cube root functions and to solve radical equations.

**Enduring Understanding:** Rational exponents and radical notation can be converted into each other, and simplified. Operations, plus compositions, can be performed on functions. Some functions have inverses that are also functions. Be careful when solving radical equations, as extraneous solutions may occur.

**Essential Questions:** How do you use rational exponents and what do they mean? How do you perform operations on functions? How do you find the inverse of a function? How do you graph radical equations? Why do you need to check your solutions when solving radical equations?

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Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

<b>Resources:</b> Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards						
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey	
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning	
				Assessments	Standards	
Evaluate <i>n</i> <sup>th</sup> Roots	2 days	Evaluate	Provide notes on $n^{\text{th}}$	Check student	HS N.RN.1	
and Use Rational		expressions using	roots (different	understanding via	HS	
Exponents		rational exponents	cases based on	oral participation.	A.REI.2	
		by converting them	whether the index is		ELA-	
		into radical form.	even or odd).	Check student	LITERACY.RST.9-	
				work.	10.4	
		Solve questions by	Provide directions			
		taking <i>n</i> <sup>th</sup> roots, and	how to convert	Check for correct		
		check solutions.	expression using	use of graphing		
			rational exponents	calculator.		
			to radicals.			
				Classwork		
			Model simplifying	assigned.		
			these expressions			

		Algebra II Ho	nors – 5 Credits		1
			and provide	Homework	
			increasingly difficult	assigned.	
			problems.	C .	
			<b>F</b>		
			Practice solving		
			equations by taking		
			$n^{\rm m}$ roots, and check		
			solutions.		
			Include word		
			problems, as time		
			permits.		
Apply Properties of	2 days	Use properties of	Remind students of	Assess student	HS N.RN.1
Rational Exponents	•	exponents to	the properties of	recall of the	HS N.RN.2
1		simplify	exponents that they	Algebra 1 topics	ELA-
		expressions having	already know and	and review where	LITERACY RST 9-
		rational approach	what they looks like	noodod	10.4
		rational exponents.	what they looks like	neeueu.	10.4
		<b>TTT 1 1 1 1</b>	with rational		
		Write radicals in	exponents.	Check student	
		simplest form.		responses.	
			Review the idea of		
		Add, subtract,	"like", and for	Classwork	
		multiply and	radicals to be "like",	assigned.	
		rationalize radicals.	they need the same	U	
			index and radicand	Homework	
			index and radicand.	assigned	
			Model adding	assigned.	
			Model adding,		
			subtracting, and		
			multiplying radicals.		
			<b>—</b>		
			Try to get student to		
			recall rationalizing		
			denominators		
			(simple), and		
			explain the process		

		Aigeora II Ho	for rationalizing		
			denominators using		
<b>D</b> 1 1	2.1	<b>.</b>	conjugates.		HONDNI 4
Review and Assess	2 days	Review using	Provide review	Circulate during	HS N.RN.1
Using Rational		rational exponents,	problems on using	review to assist	HS N.RN.2
Exponents, and		and applying	rational exponents,	students.	HS
Applying		properties.	and applying		A.REI.2
Properties			properties.	Assessment to last	ELA-
		Assess student		all period.	LITERACY.RST.9-
		understanding of	Assessment to last		10.4
		above topics.	all period.		
Perform Function	2 days	Add, subtract,	Encourage students	Check student	HS F.BF.1b
Operations and		multiply, and divide	to think about how	understanding via	HS F.BF.1c
Compositions		functions.	they would add,	oral participation.	ELA-
1			subtract, multiply.	1 1	LITERACY.RST.9-
		Find the	or divide two	Check student	10.4
		composition of	functions (This	work	1011
		functions	should be fairly	WOIR.	
		runedons.	intuitive)	Check for correct	
			intuiti vC.)	use of graphing	
			Extand discussion to	ast of graphing	
			talk about the	calculator.	
			domain of the	Classwork	
			aniginal functions	Classwork	
			original functions	assigned.	
			and the domain of	TT	
			the resulting	Homework	
			function.	assigned.	
			Provide direction on		
			how to compose		
			functions (using one		
			function as the		
			"input" of the		
			other)		
			ouler).		

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	1	Algebra II Ho	nors – 5 Credits		l
			Model problems and		
			provide independent		
			practice.		
			As time permits,		
			include a word		
			problem that uses		
			compositions		
			compositions.		
			As time permits		
			show how to check		
			compositions on the		
			compositions on the		
Lico Inverse	2 days	Find the inverse of	Bagin with a	Chaols aturdant	LIC E DE As
Use inverse	2 days	Find the inverse of	Begin with a	Check student	HS F.BF.4a
Functions		a relation or	discussion about	understanding via	HS F.BF.4b
		function, and	inverse "undoing"	oral participation.	HS F.BF.4c
		identify properties	each other. Have		HS F.BF.4d
		of inverses.	students think of	Check student work	ELA-
			examples of things,	and graphs.	LITERACY.RST.9-
		Determine whether	and then functions		10.4
		two functions are	that "undo" each	Check for correct	
		inverses of each	other.	use of graphing	
		other.		calculator.	
			Introduce function		
		Determine whether	notation and	Classwork	
		a function has an	verifying that two	assigned	
		inverse that is also a	functions are	assigned.	
		function	inverses of each	Homework	
		Tunction.	ather	nonework	
			oulei.	assigned.	
			Develop 4 stap		
			process of finding		
			process of finding		
			inverses. Graph a		
			function, its inverse		
			and the identity		

		Algebra II Ho	nors – 5 Credits		
		-	function, and have		
			students describe		
			what they see		
			(should be		
			reflections across		
			the identity). Use a		
			graphing calculator		
			to get the same		
			picture.		
			-		
			Explain the		
			Horizontal Line		
			Test, and what it		
			determines. As time		
			permits, look at the		
			parent quadratic		
			function, use the		
			HLT, but then		
			restrict the domain		
			of the parent graph		
			so it passes the HLT		
			to create an		
			invertible function.		
Review and Assess	2 days	Review performing	Provide review	Circulate during	HS F.BF.1b
Operations,		operations and	problems on	review to assist	HS F.BF.1c
Compositions, and		compositions and	performing	students.	HS F.BF.4a
Inverses		finding inverses of	operations and		HS F.BF.4b
		functions.	compositions and	Assessment to last	HS F.BF.4c
			finding inverses of	all period.	ELA-
		Assess student	functions.		LITERACY.RST.9-
		understanding of			10.4
		above topics.	Assessment to last		
			all period.		

Algebra II Honors – 5 Credits					
Graph Square Root	1 day	Graph square root	Graph square root	Check student	HS F.IF.4
and Cube Root		and cube root	and cube root	graphs.	HS F.IF.5
Functions		functions.	functions using a		HS F.IF.7b
			table of values, or a	Check for correct	HS F.BF.3
			graphing calculator.	use of graphing	
				calculator.	
			State the domain		
			and range.	Classwork	
				assigned.	
			Translate the graphs		
			by manipulating <i>h</i>	Homework	
			and $k$ .	assigned.	
			Provide practice		
			problems that cover		
		~	both types of roots.		
Solve Radical	2 days	Solve and check	Define radical	Check student	HS A.REI.2
Equations		radical equations	equations.	understanding via	
		(or equations with	<b>.</b>	oral participation.	
		rational exponents),	Introduce raising		
		and check for	both sides to the $n^{\rm m}$	Check student	
		extraneous	power property.	work.	
		solutions.		01 1	
			Provide direction	Classwork	
			now to solve radical	assigned.	
			equations and	Homoryouly	
			abash must be done	Holliework	
			check must be done.	assigned.	
			$\Delta s$ time nermits		
			solve equations with		
			two radicals		

Algebra II Honors – 5 Credits						
		C	As time permits,			
			include word			
			problems.			
Review and Assess	2 days	Review graphing	Provide review	Circulate during	HS F.IF.4	
Graphing Square		square and cube	problems on	review to assist	HS F.IF.5	
Root and Cube		root functions and	graphing square and	students.	HS F.IF.7b	
Root Functions and		solving radical	cube root functions		HS F.BF.3	
Solving Radical		equations.	and solving radical	Assessment to last	HS A.REI.2	
Equations			equations.	all period.		
		Assess student				
		understanding of	Assessment to last			
		above topics.	all period.			
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Gil	fted Students:		
Students will be allow	wed to submit assignm	ents using additional t	ime per IEP modificatio	ons.		
Students will be enco	buraged to use differen	t size and type of font	in order to avoid print c	confusion.	1	
LEP students will be	allowed to use an inte	rnet translator or langu	lage glossary in order to	b translate vocabulary	and assignments	
properly.	11 17 1 14		C1 , · , 1 · , · 1			
LEP students may be	allowed to work with	another student who is	s fluent in their native la	anguage.		
Suggested Technolo	gical innovations/ Us		. 1 1			
Instructional technolo	ogy, where available, s	should be used to prese	ent and assess lessons su	ich as; PowerPoint, Sr	MART Board, Quia,	
Kanoot, etc.				4 1- 4		
Teachers are encoura	iged to use electronic a	issessments to determine	ne mastery of concepts	taught.		
Cross Currierlan/2	s graphing calculator, a	and student use of the g	graphing calculator shot	nd be mandatory.		
Cross Curricular/ 2	I Century Connection	0 <b>015:</b> A 11 - Lu - Jane La - La 11 - Jane			11-11	
9.1 21 <sup>st</sup> Century Life	e and Career Skills:	All students will den	nonstrate the creative	, critical thinking, co	niaboration, and	
problem-solving sk	alls needed to functi	on successfully as bo	oth global citizens and	d workers in diverse	ethnic and	
organizational cult	ures.					
92 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that						
promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving						
in the global economy.						
93 21 <sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply						
knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the						
globally competitive work environment of the information age.						
			~			

#### Sayreville Public Schools Algebra II Honors – 5 Credits **Unit 4: Rational Functions**

Summary of the Unit: In this unit, students will learn to graph rational functions, to multiply, divide, add, and subtract rational expressions, and simplify complex fractions. Students will learn to solve rational equations. Finally, they will learn to identify characteristics of functions, and to compare properties of functions.

**Enduring Understanding:** Rational functions have discontinuities where the denominator is equal to zero. Knowledge of adding, subtracting, multiplying, and dividing are extended to rational expressions. Rational equations may have extraneous solutions, so a check is always needed. Functions can be increasing, decreasing, or constant over an interval, or may have even or odd symmetry, or no symmetry at all.

Essential Questions: How do you graph rational functions and where do discontinuities occur? How do you perform operations with rational expressions? How do you solve rational equations?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

<b>Resources:</b> Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards						
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey	
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning	
				Assessments	Standards	
Graph Simple	1 day	Graph simple	Graph the parent	Check student	HS A.CED.2	
<b>Rational Functions</b>		rational functions	rational function in	understanding via	HS A.CED.4	
		by identifying	order to discuss	oral participation.		
		vertical and	discontinuity,			
		horizontal	vertical asymptote,	Check student		
		asymptotes, and	horizontal	work and graphs.		
		plotting points to	asymptote, domain			
		the left and the right	and range.	Classwork		
		of the vertical		assigned.		
		asymptotes.	Provide directions			
			how to graph	Homework		
		Identify the domain	rational functions	assigned.		
		and the range of the	(find vertical and			
		function.	horizontal			
			asymptotes, and plot			

		Algebra II Ho	nors – 5 Credits		
			points to the left and right to get the branches).		
			Translate the graphs by manipulating <i>h</i> and <i>k</i> .		
Graph General Rational Functions	2 days	Graph general rational functions by identifying vertical and horizontal asymptotes (or removable discontinuities), and plotting points to the left and the right of the vertical asymptotes (or removable discontinuities.	Graph rational functions (factor denominator to see where discontinuities will be), factor numerator to determine what kind of discontinuities will be present (non- removable or removable or removable discontinuities), find equations of vertical asymptotes or coordinates of the point discontinuities, find equation of horizontal asymptote, if one exists, and discuss domain and range. Model a few graphs and provide practice problems.	Check student understanding via oral participation. Check student work and graphs. Classwork assigned. Homework assigned. Take-home assessment may be started in class.	HS F.IF.7d

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		Algebra II Ho	nors – 5 Credits			
Multiply and	1 day	Multiply and divide	Start with	Check student	HS A.APR.7	
Divide Rational		rational expressions	simplifying rational	understanding via		
Expressions		correctly.	expressions first.	oral participation.		
			Factor numerator			
			and denominator,	Check student		
			identify domain	work.		
			restrictions, then			
			cancel common	Classwork		
			factors. Then move	assigned.		
			onto multiplying			
			and dividing rational	Homework		
			expressions.	assigned.		
			•	C		
			Model, then provide			
			practice problems.			
Add and Subtract	2 days	Add and subtract	Help students recall	Check student	HS A.APR.7	
Rational		rational expressions	how to find the LCD	understanding via		
Expressions		correctly after	in simple arithmetic	oral participation.		
-		finding the LCD.	problems and extend			
		U	that knowledge to	Check student		
			algebraic	work.		
			expressions (may			
			have to factor	Classwork		
			denominators).	assigned.		
			Provide a method to	Homework		
			find the LCD, and	assigned.		
			then a way to make	C		
			both denominators			
			"match", in order to			
			add or subtract			
			correctly.			
			-			

	1	Algebra II Ho	nors – 5 Credits	1	1
			Model problems,		
			and provide practice		
			problems.		
Solve Rational	1 day	Solve rational	Provide directions	Check student	HS A.REI.2
Equations		equations by	on how to solve	understanding via	
•		finding, and	rational equations	oral participation.	
		multiplying through	by finding, and	1 1	
		by the LCD to	multiplying through	Check student	
		create a simpler	by the LCD to	work.	
		equation to solve.	create a simpler		
		equation to solver	equation to solve	Classwork	
			equation to solve.	assigned	
			Remind students	ussigned.	
			that a check must be	Homework	
			done because	assigned	
			extraneous solutions	assigned.	
			can occur.		
			Model comple		
			model sample		
			problems, and		
			provide practice.		
			See if students can		
			point out when		
			cross-multiplying		
			can be used to		
			solve rational		
Describe and	2 days	Analyze and	Define increasing	Check student	HS F IF 6
Compare Function	2 auj 6	compare functions	decreasing and	understanding via	HSFIF9
Characteristics		and describe	constant Show	oral participation	FLA-
Characteristics		functions over	graphs that exhibit	oral participation.	LITERACY RST 9
		intervals using the	these characteristics	Check student	10 5
		words increasing	and see if students	work	10.3
		doorooging and	and see it students	WUIK.	
		accreasing, and	intervale over which		
1		constant.	mervals over which		1

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	1	Algebra II Ho	nors – 5 Credits	1		
		-	each of these are	Classwork		
		Investigate rate of	occurring.	assigned.		
		change.				
			Revisit idea of	Homework		
		Explore even vs.	local maximum and	assigned.		
		odd symmetry.	local minimum.			
			Investigate average			
			rate of change			
			through word			
			problems.			
			1			
			Explore even vs.			
			odd symmetry			
			graphically and			
			algebraically.			
Assessment on	1 day	Review	Provide review	Circulate during	HS A.APR.7	
Multiplying.	5	multiplying.	problems on	review to assist	HS A.REI.2	
Dividing. Adding.		dividing, adding.	multiplying.	students.	ELA-	
and Subtracting		and subtracting	dividing. adding.		LITERACY.RST.9-	
Rational		rational	and subtracting	Assessment to last	10.5	
Expressions.		expressions, solving	rational expressions.	all period.		
Solving Rational		rational equations.	solving rational	1		
Equations, and		and describing	equations, and			
Describing		function	describing function			
Function		characteristics.	characteristics.			
Characteristics						
		Assess student	Assessment to last			
		understanding of	all period.			
		above topics.	1			
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Gi	fted Students:	l	
Students will be allow	wed to submit assignm	ents using additional t	ime per IEP modification	ons.		
Students will be enco	ouraged to use differen	t size and type of font	in order to avoid print of	confusion.		
LEP students will be	allowed to use an inte	rnet translator or langu	age glossary in order to	o translate vocabulary	and assignments	
properly.		U		2	C	

#### Algebra II Honors – 5 Credits

LEP students may be allowed to work with another student who is fluent in their native language.

#### Suggested Technological Innovations/ Use:

Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia, Kahoot, etc.

Teachers are encouraged to use electronic assessments to determine mastery of concepts taught.

Demonstration of the graphing calculator, and student use of the graphing calculator should be mandatory.

#### **Cross Curricular/ 21st Century Connections:**

9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

#### Sayreville Public Schools Algebra II Honors – 5 Credits Unit 5: Exponential and Logarithmic Functions

**Summary of the Unit:** Students will learn to graph and use exponential growth and decay functions, including functions using the natural base *e*. Next, they will learn to evaluate and graph logarithmic functions and to use the properties of logarithms to rewrite logarithmic expressions. Then, students will learn to solve exponential and logarithmic equations. Finally, students will learn to write and apply exponential and power functions.

**Enduring Understanding:** Exponential and logarithmic functions are inverses of each other. Exponential growth and decay functions model read-world phenomena, such as bacteria growth or radioactive decay. Properties of logarithms mirror properties of exponents because a logarithm is an exponent. Solving exponential equations involves taking the logarithm of both sides of the equation. Logarithmic equations may have extraneous solutions, so a check is always needed.

**Essential Questions:** How do you graph exponential and logarithmic functions? What is the domain and range of an exponential function or a logarithmic function? How do you solve exponential and logarithmic equations? What real-world scenarios can be solved using exponential and logarithmic equations?

Summative Assessn	nent and/ or Summat	ive Criteria to demon	strate mastery of the l	U <b>nit.</b>				
Section Quizzes, End	l of Unit Tests, and En	d of Quarter Exam	-					
Resources: Larson	Resources: Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards							
<b>Topic/ Selection</b>	pic/Selection Suggested General Instructional Suggested							
	Timeline per topic	Objectives	Activities	Benchmarks/	<b>Student Learning</b>			
				Assessments	Standards			
Graph Exponential	1 day	Graph exponential	Students will graph	Check student	HS F.IF.4			
<b>Growth Functions</b>		growth functions	a simple exponential	understanding via	HS F.IF.7e			
		and their	growth function,	oral participation.	HS F.IF.8b			
		transformations,	such as $\mathbb{P} = 2^{\mathbb{P} \mathbb{P}}$ by		HS F.BF.3			
		and identify their	hand or by	Check student work	HS F.LE.5			
		growth factors,	calculator, and as a	and graphs.	ELA-			
		domains, ranges,	class will explore		LITERACY.RST.9			
		intercepts and	domain, range,	Check for correct	10.7			
		asymptotes.	asymptotes and	use of graphing				
			intercepts.	calculator.				
		Use exponential	_					
		growth formula and	Formalize notes on	Classwork				

the graph of 22(22) =

assigned.

compound interest

		Algebra II Ho	nors – <u>5 Credits</u>		
		formula to solve	???? <sup>™</sup> to include		
		real-word problems.	definition of a	Homework	
			growth factor, and a	assigned.	
			restriction that <i>b</i> >1.		
			Use the graphing		
			calculator to explore		
			changes to $a$ $h$ and		
			k in the equation		
			$h = p_{0}p_{0} \frac{m}{h} + h_{1}$		
			$m - m m + \kappa \kappa$		
			Define exponential		
			growth model and		
			introduce the		
			compound interest		
			formula and use		
			them to colve word		
			ment to solve word		
	1 1		problems.		
Graph Exponential	1 day	Graph exponential	Students will graph	Check student	HS F.IF.4
Decay Functions		decay functions and	a simple exponential	understanding via	HS F.IF./e
		their	decay function, such	oral participation.	HS F.IF.8b
		transformations,	as $\mathbb{C} = \mathbf{O}^{1} \mathbf{A}^{\mathbb{D}}$ by hand		HS F.BF.3
		and identify their	2	Check student work	HS F.LE.5
		growth factors,	or by calculator, and	and graphs.	ELA-
		domains, ranges,	as a class will		LITERACY.RST.9-
		intercepts and	explore domain,	Check for correct	10.7
		asymptotes.	range, asymptotes	use of graphing	
			and intercepts.	calculator.	
		Use exponential			
		decay formula to	Formalize notes on	Classwork	
		solve real-word	the graph of $\mathbb{D}(\mathbb{D}) =$	assigned.	
		problems.	???? <sup>??</sup> to include	C C	
		1	definition of a decay	Homework	
			factor, and a	assigned.	
				0	

	1	Algebra II Ho	nors – 5 Credits		l
			restriction that	*Quarterly 2	
			0 <b<1.< td=""><td>Assessment</td><td></td></b<1.<>	Assessment	
				material ends here.	
			Use the graphing		
			calculator to explore		
			changes to a, h, and		
			k in the equation		
			$n = n n n^{n-h} + kk$		
			Define exponential		
			decay model use it		
			to solve word		
			problems.		
Extension –	1 day	Rewrite exponential	Use examples of	Check student	HS A.SSE.3c
Transform	5	growth and decay	real-life problems to	understanding via	HS F.LE.5
Expressions of		functions to	show students how	oral participation.	ELA-
Exponential		understand more	to use properties of	oral participation.	LITERACY RST 9-
Functions		completely the real-	rational exponents	Check student	10.7
T unetions		life situations these	to transform	work	10.7
		functions model	expressions of	WOIK.	
		runctions model.	expressions of	Classwork	
			functions so the rate	assigned	
			of increase or	assigned.	
			doorooso oro moro	Uomowork	
			alaar (Include	nonework	
			reblems such as	assigned.	
			problems such as		
			percent increase to a		
			monuny percent		
			increase, radioactive		
			decay, and		
			"doubling"		
			functions.)		

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	1	Algebra II Ho	nors – 5 Credits				
Use Functions	1 day	Understand where	Develop the idea of	Check student	HS F.IF.4		
Involving <i>e</i>		the natural base e	where the natural	understanding via	HS F.IF.7e		
		comes from.	base e comes from	oral participation.	HS F.IF.8b		
			by using the		HS F.BF.3		
		Simplify natural	graphing calculator	Check student work	HS F.LE.5		
		base expressions,	to explore where the	and graphs.			
		graph the natural	r				
		base function and	$y$ -value of $w = \mathbf{v} 1 \mathbf{T}$	Check for correct			
		translations of it.	approaches as	use of graphing			
			22	calculator.			
		Use the formula for	the x-values	• • • • • • • • • • • • • • • • • • • •			
		interest	approach infinity.	Classwork			
		compounded		assigned			
		continuously	Graph $UU = UU \overset{au}{=} and$	ussigned.			
		continuousiy.	$22 = 22^{-10}$ , and	Homework			
			discuss why one	assigned			
			is growth and the	assigned.			
			other is decay.				
			Graph translations				
			of the natural base				
			function.				
			Introduce the				
			formula for interest				
			compounded				
			continuously, and				
			use it to solve word				
			problems.				
Evaluate	2 days	Rewrite logarithmic	Explore what a	Check student	HS F.IF.7e		
Logarithms and		and exponential	logarithm is by	understanding via	HS F.BF.3		
Graph Logarithmic		form and evaluate	posing the	oral participation.	HS F.BF.4b		
Functions		logarithms.	questions: " $10^0 = ?$ ,		HS F.BF.5		
		-	$10^1 = ?, 10^2 = ?, so$	Check student work	ELA-		
		Use inverse	then what is x in	and graphs.	LITERACY.RST.9-		
		properties of			10.4		

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		logarithms to find	$10^{22} = 50?$ " Use	Check for correct		
		inverse functions.	the graphing	use of graphing		
			calculator to make	calculator.		
			guesses and to			
			discover that a	Classwork		
			logarithm is an	assigned.		
			exponent.			
				Homework		
			Graph an	assigned.		
			exponential function			
			such as $\mathbb{Z} = 2^{\mathbb{Z}}$ .			
			Have students recall			
			all they can about			
			inverse functions,			
			and use that			
			knowledge to graph			
			the inverse of that			
			exponential function			
			(the result will be a			
			logarithmic			
			function). Discuss			
			domain, range,			
			asymptotes and			
			intercept. Graph			
			translations of			
			logarithmic			
			functions.			
			Explain how to			
			convert from			
			exponential form to			
			logarithmic form			
			and vice versa, and			
			use this knowledge			

		Algebra II Ho	nors – 5 Credits		Γ
			to evaluate		
			logarithms.		
Review and Assess	2 days	Review graphing	Provide review	Circulate during	HS F.IF.4
Graphing		exponential and	problems on	review to assist	HS F.IF.7e
Exponential and		logarithmic	graphing	students.	HS F.IF.8b
Logarithmic		functions,	exponential and		HS F.BF.3
Functions,		transforming	logarithmic	Assessment to last	HS F.BF.4b
Transforming		expressions of	functions,	all period.	HS F.BF.5
Expressions of		exponential	transforming	_	HS F.LE.5
Exponential		functions, using	expressions of		ELA-
Functions, Using		functions involving	exponential		LITERACY.RST.9-
Functions		<i>e</i> , and evaluating	functions, using		10.4
Involving <i>e</i> , and		logarithms.	functions involving		ELA-
Evaluating			<i>e</i> , and evaluating		LITERACY.RST.9-
Logarithms		Assess student	logarithms.		10.7
		understanding of			
		above topics.			
			Assessment to last		
			all period.		
Apply Properties of	2 days	Simplify and	Have students recall	Check student	HS A.SSE.3
Logarithms		evaluate	properties of	understanding via	HS F.BF.5
		expressions using	exponents	oral participation.	
		properties of	(specifically		
		logarithms.	product, quotient,	Check student	
			and power), and	work.	
		Use the Change of	frame a discussion		
		Base Formula.	about properties of	Check for correct	
			logarithms around	use of graphing	
			this information,	calculator.	
			since logarithms are		
			exponents.	Classwork	
				assigned.	
			Use increasingly		
			difficult levels of	Homework	
			problems expanding	assigned.	

		Algebra II Ho	nors – 5 Credits	Γ	
			and condensing		
			logarithms.		
			-		
			Introduce the		
			Change of Base		
			Formula and use it		
			romuna, and use n		
			logarithms that do		
			not use the common		
			base. ("Check" that		
			the answer is correct		
			using the definition		
			of logarithm and		
			storing the value		
			into the graphing		
			calculator)		
			culculator.)		
			As time permits		
			As unic permits,		
			problems that use		
		~	logarithms.	~	
Solve Exponential	3 days	Solve exponential	Provide notes and	Check student	HS F.BF.5
and Logarithmic		equations where the	examples on solve	understanding via	HS F.LE.4
Equations		bases on each side	exponential	oral participation.	
		can be converted to	equations where the		
		the same base.	bases on each side	Check student	
			can be converted to	work.	
		Solve exponential	the same base. Use		
		equations where the	the graphing	Check for correct	
		bases on each side	calculator to	use of graphing	
		can NOT be	"check" solutions	calculator	
		converted to the	encer borations.	curculation.	
		come base	Provide notes and	Classwork	
		same vase.	averables on solve	Classwork	
			examples on solve	assigned.	
			exponential		

Algebra II Honors – 5 Credits						
		Solve logarithmic	equations where the	Homework		
		equations, in one of	bases on each side	assigned.		
		the two following	can NOT be			
		cases: 1) in	converted to the			
		problems where	same base. Use the			
		you have (or can	graphing calculator			
		obtain by using log	to "check"			
		properties) "log"	solutions.			
		with the same base				
		on BOTH sides, or	Provide notes and			
		2) in problems	examples on how to			
		where you have (or	solve logarithmic			
		can obtain by using	equations, in one of			
		log properties) one	the two following			
		"log" on one side,	cases: 1) in			
		but not on the other.	problems where you			
			have (or can obtain			
			by using log			
			properties) "log"			
			with the same base			
			on BOTH sides, or			
			2) in problems			
			where you have (or			
			can obtain by using			
			log properties) one			
			"log" on one side,			
			but not on the other.			
			Use the graphing			
			calculator to			
			"check" solutions.			
			As time permits,			
			include word			
			problems.			
			-			

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	Algebra II Honors – 5 Credits							
Write and Apply	2 days	Write an	Model writing an	Check student	HS F.LE.2			
Exponential and		exponential model	exponential model	understanding via	HS S.ID.6 (as time			
Power Functions		or a power model	or a power model	oral participation.	permits)			
		for a graph, given	for a graph, given					
		two points that the	two points that the	Check student				
		graph passes	graph passes	work.				
		through.	through. Use					
		U	multiple example	Check for correct				
			reinforce concepts	use of graphing				
			(remind students	calculator.				
			that they have					
			solved systems of	Classwork				
			equations before,	assigned.				
			and they will use	8				
			those skills now).	Homework				
				assigned.				
			As time permits.	8				
			write exponential					
			and power models					
			for sets of data					
			points, using the					
			calculator to					
			perform regressions					
Review and Assess	2 days	Review applying	Provide review	Circulate during	HS A SSE 3			
Applying	2 duy5	properties of	problems on	review to assist	HS F BF 5			
Properties of		logarithms solving	applying properties	students	HSFIFA			
Logarithms		exponential and	of logarithms	students.	115 I .LL. <del>T</del>			
Logarithins,		logarithmic	solving exponential	Assessment to last				
Exponential and		acuations and	and logarithmic	all period				
Logarithmic		writing and	and logarithmic	all period.				
Educations and		writing and	equations, and					
Writing and		apprying exponential and	exponential and					
Applying		exponential and	exponential and					
Exponential and		power functions.	power functions.					
Exponential and								
Power Functions								

Algebra II Honors – 5 Credits							
		Assess student	Assessment to last				
		understanding of	all period.				
		above topics.					

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

Students will be allowed to submit assignments using additional time per IEP modifications.

Students will be encouraged to use different size and type of font in order to avoid print confusion.

LEP students will be allowed to use an internet translator or language glossary in order to translate vocabulary and assignments properly.

LEP students may be allowed to work with another student who is fluent in their native language.

#### Suggested Technological Innovations/ Use:

Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia, Kahoot, etc.

Teachers are encouraged to use electronic assessments to determine mastery of concepts taught.

Demonstration of the graphing calculator, and student use of the graphing calculator should be mandatory.

#### **Cross Curricular/ 21st Century Connections:**

9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

#### Sayreville Public Schools Algebra II Honors – 5 Credits Unit 6: Quadratic Relations and Conic Sections

**Summary of the Unit:** This unit introduces students to the properties and characteristics of the parabola (as time permits at the end of the course, other conics may be explored). Students will graph and write equations of parabolas. Finally, students will use graphing, substitution, or elimination to solve quadratic systems.

**Enduring Understanding:** Students will understand and be able to visualize and sketch key parts of a parabola, whether it is a function or not. Equations of parabolas can be written given characteristics of it. Students will be able to recognize that techniques used in solving systems of linear equations can also be used to solve quadratic systems.

**Essential Questions:** What are the key parts of a parabola? How do you write the equation of a parabola given certain characteristics of it? How do you graph a parabola given its equations? What techniques can be used to solve a quadratics system? What does/do the solution(s) of a quadratic system represent?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

Resources: Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards							
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey		
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning		
				Assessments	Standards		
Graph and Write	2 days	Graph and write	Highlight key parts	Check student	HS A.REI.10		
Equations of		equations of	of a parabola	understanding via	HS G.GPE.2		
Parabolas		parabolas.	(vertex, focus,	oral participation.			
			directrix, axis of				
			symmetry, direction	Check student			
			of opening, latus	work and graphs.			
			rectum and its				
			length).	Classwork			
				assigned.			
			Graph a parabola				
			given its equation	Homework			
			and write an	assigned.			
			equation of a				
			parabola given				
			characteristics of it.				

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		Algebra II Ho	nors – 5 Credits		
		0	As time permits, explore real-world problems using parabolas, such as satellite dishes.		
Solve Quadratic Systems	2 days	Solve quadratic systems by graphing, substitution, or elimination.	Have students recall methods of solving linear systems (graphing, elimination, and substitution). Have students recall how many solutions a systems of linear equations can have. Indicate that the same techniques can be used for quadratic systems. Discuss the number of solutions possible in a quadratic system. Solve multiple systems using the above techniques, stressing that solutions can be checked algebraically.	Check student understanding via oral participation. Check student work. Check for correct use of graphing calculator. Classwork assigned. Homework assigned.	HS A.REI.7

Algebra II Honors – 5 Credits					
			As time permits,		
			show how to use the		
			graphing calculator		
			to draw conics (may		
			need plus or minus		
			to get both parts),		
			and find points of		
			intersection.		
Assess Graphing	1 day	Assess student	Assessment to last	Assessment to last	HS
and Writing		understanding of	all period.	all period.	A.REI.10
Equations of		graphing and			HS G.GPE.2
Parabolas, and		writing equations of			HS A.REI.7
Solving Quadratic		parabolas, and			
Systems		solving quadratic			
		systems.			
Suggested Modificat	tions for Special Edu	cation, English Lang	lage Learners and Gif	fted Students:	
Students will be allow	ved to submit assignm	ents using additional t	ime per IEP modification	ons.	
Students will be enco	ouraged to use differen	t size and type of font	in order to avoid print o	confusion.	
LEP students will be	allowed to use an inte	rnet translator or langu	age glossary in order to	translate vocabulary	and assignments
properly. LEP studer	nts may be allowed to	work with another stud	lent who is fluent in the	eir native language.	
Suggested Technolo	gical Innovations/ Us	se:			
Instructional technolo	ogy, where available, s	should be used to prese	ent and assess lessons su	ich as; PowerPoint, SI	MART Board, Quia,
Kahoot, etc.			_		
Teachers are encoura	ged to use electronic a	assessments to determine	ne mastery of concepts	taught.	
Demonstration of the	graphing calculator, a	and student use of the g	graphing calculator shou	ıld be mandatory.	
Cross Curricular/ 2	1 <sup>st</sup> Century Connection	ons:			
9.1 21 <sup>st</sup> Century Life	e and Career Skills: A	All students will den	nonstrate the creative	, critical thinking, co	ollaboration, and
problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and					
organizational cult	ures.				
92 21 <sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that					
promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving					
in the global economy.					
9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply					

#### Algebra II Honors – 5 Credits

knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

## **Unit 7: Trigonometric Ratios**

**Summary of the Unit:** Students will learn the right triangle definitions of the six trigonometric functions and how to use right triangle trigonometry. Next, they will learn to use radian measure and to evaluate trigonometric functions of any angle.

**Enduring Understanding:** The trigonometric ratios used in right triangle trigonometry are based on the concept of similar triangles. Concepts such at the Pythagorean Theorem are carried over from the study of Geometry. Angles can be measured in degrees or radians. Trigonometric ratios can be found for acute angles using right triangle trigonometry, and can be found for other types of angles using radian measure and/or the unit circle.

**Essential Questions:** How are trigonometric functions used in right triangles? What is radian measure? How can you evaluate trigonometric functions of any angle?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit.								
Section Quizzes, End	Section Quizzes, End of Unit Tests, and End of Quarter Exam							
<b>Resources: Larson</b>	Algebra 2 Common (	Core Edition (©2012)	and New Jersey Stude	ent Learning Standar	ds			
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey			
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning			
				Assessments	Standards			
Use Trigonometry	5 days (includes	Solve right triangles	Review what	Check student	HS G.SRT.6			
with Right	assessment)	using properties of	students can/should	understanding via	HS G.SRT.8			
Triangles		special right	recall from	oral participation.	ELA-			
		triangles and right	Geometry:		LITERACY.RST.9-			
		triangle definitions	Pythagorean	Check student	10.5			
		of the six	Theorem,	work and diagrams.				
		trigonometric	Pythagorean triples,					
		functions.	and 30-60-90 and	Check for correct				
			45-45-90 triangles.	use of graphing				
		Solve word	Derive the	calculator (degree				
		problems involving	relationships of the	mode vs. radian				
		angle of elevation	sides in the special	mode).				
			right triangles, as					

	Algebra II Honors – 5 Credits							
		and angle of	needed. Point out	Classwork				
		depression.	trigonometric ratios	assigned.				
			are equal in similar					
		Solve for all	triangles. Review	Homework				
		missing parts of a	right triangle	assigned.				
		right triangle, given	trigonometry when	0				
		two sides, or given	solving for sides,	Quiz covering				
		one trigonometric	and using inverse	these topics.				
		ratio in the triangle.	trigonometry when	I				
		b	solving for angles.					
			6 6					
			Introduce the					
			reciprocal functions.					
			and point out co-					
			function					
			relationships.					
			renerationshipsi					
			Work on word					
			problems that					
			involve angle of					
			elevation and angle					
			of depression					
			of depression.					
			As time permits.					
			discuss GPS.					
			latitude and					
			longitude, and					
			converting angles in					
			degree to degree					
			minutes and					
			seconds, and vice					
			versa.					
Define General	4 days (includes	Define angles in	Intro key	Check student	HS F.TF.1			
Angles and Use	assessment)	standard position	vocabulary: Angle	understanding via	HS F.TF.2			
Radian Measure	······································	initial side, and	made by rotating a	oral participation.	HS F.TF.3			

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	Algebra II Ho	nors – 5 Credits		
	terminal side;	ray about a point,		HS G.C.5
	distinguish between	Angle in standard	Check student	ELA-
	positive and	position, vertex,	work and diagrams.	LITERACY.RST.9-
	negative angles;	initial ray, terminal		10.4
	find co-terminal	ray, positive angle,	Review fraction	
	angles,	negative angle.	work, as needed.	
	complementary	Draw a positive		
	angles and	angle and negative	Classwork	
	supplementary	angle that are co-	assigned.	
	angles, and sketch	terminal, and have		
	angle (both in	student supply	Homework	
	degree measure and	definition of co-	assigned.	
	radian measure).	terminal.	U	
			Ouiz covering	
	Define radian in	Recall Quadrants.	these topics.	
	terms of the	degrees in full and	I I I I I I I I I I I I I I I I I I I	
	measure of the	$\frac{1}{2}$ rotation		
	central angle of a	complementary		
	circle	supplementary		
	chicle.	acute right obtuse		
	Find arc length and	reflexive angles		
	area of a sector	greater than 360 and		
	area of a sector.	Quadrantal angles		
		Quadrantai angles.		
		Write the definition		
		of radian on the		
		board ask students		
		to read What does it		
		moon? To explain		
		drew a airele on the		
		board and draw in a		
		rodius (where initial		
		radius (where initial		
		ray in standard		
		position would be).		
		Cut a length of		

Algebra II Honors – 5 Credits	
twine equal to the	
length of the radius.	
Use the twine to	
measure an arc on	
the circle. Draw	
terminal ray to meet	
end of arc. That	
central angle is a	
radian. Have	
students estimate the	
degree measure	
(about $60^{\circ}$ is fine for	
now.).	
Intro formula for	
$s=r\theta$ . In a circle,	
$C=2\pi r$ , and	
circumference is an	
arc made rotating	
and angle a full	
rotation. Plug into	
$s=r\theta$ to show a full	
rotation in radians is	
$2\pi$ .	
Draw xy axes, and	
label radian	
measures for 0, 90.	
180, 270 and 360	
degrees. Draw xy	
axes again, and draw	
1. 2. 3. 4. 5. 6	
radiansa bit more	
than 3 fit in 180	
degrees (3.14!).	

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Algebra II Honors – 5 Credits

Algebra II 110	1013 - 3 Creatis	
	Also show area of a sector formula, and where is comes from $A=1/2(r^2)\pi$ .	
	Develop conversion factor for degrees and radians from the fact that $180^\circ = \pi$ radians. Show what $1^\circ$ equals and what one radian equals (and use a calculator to show it is about $57^\circ$ ).	
	Formalize: To convert degrees to radians, multiply degrees by $\pi/180$ degrees; and to convert radians to degrees, multiply radians by 180 degrees/ $\pi$ .	
	Introduce 17 special angles, and how to find the radian measures quickly. Review co-terminal, complementary and supplementary	

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		Algebra II Ho	nors – 5 Credits	1	1
			angles, and find		
			them in radian		
			measure (review		
			fraction work as		
			needed).		
Evaluate	5 days (includes	Find reference	Define a reference	Check student	HS F.TF.2
Trigonometric	assessment)	angles, and evaluate	angle for an angle $\theta$	understanding via	HS F.TF.3
Functions of Any		the trigonometric	(the reference angle,	oral participation.	ELA-
Angle		function of any	$\theta$ , is the acute angle		LITERACY.RST.9-
		special angle using	between the terminal	Check student	10.4
		reference angles.	ray of the angle $\theta$	work and diagrams.	
		Given an ordered	and the horizontal		
		pair on the terminal	axis). Draw an angle	Classwork	
		ray of an angle in	in each of the 4	assigned.	
		standard position,	quadrants and have		
		SWBAT evaluate	students show where	Homework	
		the 6 trigonometric	the reference angle	assigned.	
		functions of that	is. Then give an	e	
		angle.	angle measure for $\theta$ .	Ouiz covering	
		0	and have students	these topics.	
		Predict the sign of a	find the measure of	· · · · · · · · · · · · · · · · · · ·	
		trigonometric	$\theta$ ' (start with		
		function depending	degrees i.e. 300		
		on the Ouadrant its	135. and then		
		terminal ray lies in.	formalize process.		
		Use this knowledge	so they can do this		
		to develop the	for radian measure		
		definitions of the 6	i.e. $3\pi/4$ ).		
		trigonometric	,		
		functions based on	Review sides of 30-		
		<i>x</i> , <i>v</i> , and <i>r</i> .	60-90 and 45-45-90		
		, , ,	triangles. Then.		
		Evaluate	given a special angle		
		trigonometric	$\theta$ , find $\theta$ ', and use $\theta$ '		
		functions of any	to draw a special		

Sayreville Public Schools						
		Algebra II Ho	nors – 5 Credits	1		
		angle with respect	right triangle and			
		to $x$ , $y$ , and $r$	evaluate the 6 trig			
		(including	functions for that			
		quadrantal angles).	angle (use right			
			triangle			
			trigonometry).			
			6			
			Practice: given a			
			point on the terminal			
			ray of an angle $\theta$			
			find $\sin \theta \cos \theta$ and			
			tan A Expand			
			definition to include			
			noints on terminal			
			points on terminal ray of an angle $(r, y)$			
			Tay of all alight $(x, y)$			
			more/less than one			
			unit away from the			
			origin (introduce			
			" <i>r</i> "). $M = • M^2 +$			
			<u>2</u> 2.			
			Have students come			
			up with the			
			definitions of the 6			
			trigonometric			
			functions in terms of			
			x, y, and r. Expand			
			exploration to have			
			students predict the			
			sign of the 6			
			trigonometric			
			functions in each			
			auadrant based on			
			the signs of the (r w)			
			no signs of the $(x, y)$			
			Dall.			

r	Algebra II Honors – 5 Credits					
	Do problems where					
	one trigonometric					
	ratio of an angle and					
	the Quadrant where					
	the terminal ray lie					
	are given, and find					
	the remaining					
	trigonometric					
	functions. Or					
	problems where one					
	trigonometric ratio					
	of an angle is given,					
	and the sign of					
	another					
	trigonometric ratio					
	is given, find the					
	remaining ratios.					
Suggested Modifications for Special Edu	cation, English Language Learners and Gifted Students:					
Students will be allowed to submit assignm	ents using additional time per IEP modifications.					
Students will be encouraged to use differen	t size and type of font in order to avoid print confusion.					
LEP students will be allowed to use an inter-	rnet translator or language glossary in order to translate vocabulary and assignments					
properly.						
LEP students may be allowed to work with	another student who is fluent in their native language.					
Suggested Technological Innovations/ Us	ie:					
Instructional technology, where available, s	should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia,					
Kahoot, etc.						
Teachers are encouraged to use electronic a	ssessments to determine mastery of concepts taught.					
Demonstration of the graphing calculator, a	and student use of the graphing calculator should be mandatory.					
Cross Curricular/ 21 <sup>st</sup> Century Connection	ons:					
91 21 <sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and						
problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and						
organizational cultures						
02 21st Contury Life and Caroor Skille: Personal Einancial Literacy: All students will develop skills and strategies that						
3/2 21 <sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that						
promote personal and imaticial respons	sioney related to marcial planning, savings, investment, and charitable giving					
	Dage 61 of					
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in the global economy.

9.3 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

## **Unit 8: Trigonometric Graphs and Identities**

**Summary of the Unit:** Students are introduced to the graphs of sine, cosine, and tangent functions, as well as translations and reflections of the functions. Then students will study and prove trigonometric identities.

**Enduring Understanding:** Sine, cosine, and tangent functions are periodic. Sine and cosine functions oscillate about a midline, with a specific amplitude, and their domain is all real numbers. The parent tangent function is undefined for odd multiples of  $\pi^{\pi\pi}$ , and  $_2$  has vertical asymptotes at those values.

**Essential Questions:** How do you graph the sine, cosine, and tangent functions? What causes a trigonometric function to be translated or reflected? How do you prove a trigonometric identity?

**Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit.** Section Ouizzes, End of Unit Tests, and End of Ouarter Exam

Section Quizzes, End	d of Unit Tests, and En	id of Quarter Exam					
Resources: Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards							
Topic/ Selection	Suggested	General	Instructional	Suggested	New Jersey		
-	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning		
				Assessments	Standards		
Graph Sine,	3 days	Sketch the graphs	Provide sketches of	Check student	HS F.IF.7e		
Cosine, and		of sine and cosine	the parent graphs of	understanding via	HS F.TF.5		
Tangent Functions		functions, after	$y=\sin x$ and $y=\cos x$ ,	oral participation.	ELA-		
		identifying	and discuss domain,		LITERACY.RST.9-		
		amplitude, period,	range, amplitude,	Check student work	10.7		
		and the 5 key points	period, and x-	and diagrams.			
		needed to sketch	intercepts (note the				
		the graph.	5 key points that are	Classwork			
			needed to sketch a	assigned.			
		Sketch the graph of	complete curve).				
		the tangent function					

		Algebra II Ho	nors – 5 Credits		
		after identifying	Discuss and practice	Homework	
		period and	graphing y=a sin bx	assigned.	
		asymptotes.	and $y = a \cos bx$ ,		
			making changes in a		
			and <i>b</i> .		
			Repeat for the		
			graphs of v=tan $x$		
			and $v=a \tan bx$ .		
			discussing period.		
			domain (results in		
			vertical		
			asymptotes) range		
			and $r_{-}$ intercents		
			and x- intercepts.		
			$\Delta s$ time permits		
			include word		
			nrohlems		
Translate and	3 dave	Translate and	Have students recell	Chaolz student	
Deflect	Judys	raflast sing againg	what abanging h and	understanding via	
Triconomotrio		reflect sille, cosille,	k de se te s snorth	understanding via	
Graphs		and tangent graphs.	k does to a graph.	oral participation.	НЗ Г.1Г.3
Oraphis			Discuss how to	Chack student work	
			aroph 22 -	and diagrams	
			graph dd -	and diagrams.	
				Classwork	
			00=0000000000000000000000000000000000	Classwork	
			<i>kk</i> , byfindingthe period	assigned.	
			and amplitude,	Homowowl	
			drawing the midline	HOINEWORK	
			y=k, and locating	assigned.	
			the 5 key points by		
			translating thegraph		
			of		
			??=		
			22 sin2222 or 22 =		

		Algebra II Ho	$\frac{\text{nors} - 5 \text{ Credits}}{\text{borizontally} \text{ and } k}$		
			upits vortically		
			units vertically.		
			Depart discussion		
			$\operatorname{for} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		
			(-h) + kk, by finding the		
			period and		
			asymptotes, drawing		
			the midline, and		
			translating the graph		
			of22=22tan2222hunits		
			horizontally, and k		
			units vertically.		
			Indicate that when		
			a < 0, the graph is		
			reflected.		
			Start with simple		
			translations and		
			reflections then		
			move into problems		
			that have both		
Vorify	2 days	Use fundamental	Provide notes on the	Check student	HS E TE 8
Trigonometric	2 days	trigonomotrio	raciprocal identities	understanding via	
Ingonometric		identities to	tongant and	and nonticipation	115 U.SK1./
Identities		airentifes to	tangent and	oral participation.	
		simpiny	Desthe a survey		
		trigonometric	Pythagorean	Check student	
		expressions.	Identities, Co-	WORK.	
			function Identities,	~	
		Verify	and negative angle	Circulate to assist	
		trigonometric	identities.	student who get	
		identities.		stuck on the proofs.	

		Algebra II Ho	nors – 5 Credits			
			Provide tips on how	Classwork		
			to simplify and	assigned.		
			verify trigonometric			
			identities (for	Homework		
			example, change	assigned.		
			everything into sine	C		
			and cosine).			
			,			
			Model several			
			examples, then			
			provide independent			
			or paired practice.			
Review and Assess	2 days	Review graphing	Provide review	Circulate during	HS F.IF.7e	
Graphing Sine,		sine, cosine, and	problems on	review to assist	HS F.BF.3	
Cosine, and		tangent functions,	graphing sine,	students.	HS F.TF.5	
Tangent Functions,		their translations	cosine, and tangent		HS F.TF.8	
Their Translations		and reflections, and	functions, their	Assessment to last	HS G.SRT.7	
and Reflections,		verifying	translations and	all period.		
and Verifying		trigonometric	reflections, and			
Trigonometric		identities.	verifying	*Quarterly 3		
Identities			trigonometric	Assessment		
		Assess student	identities.	material ends here.		
		understanding of				
		above topics.	Assessment to last			
			all period.			
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Gif	fted Students:		
Students will be allow	wed to submit assignm	ents using additional t	ime per IEP modification	ons.		
Students will be encouraged to use different size and type of font in order to avoid print confusion.						
LEP students will be	allowed to use an inte	rnet translator or langu	age glossary in order to	o translate vocabulary	and assignments	
properly.						
LEP students may be allowed to work with another student who is fluent in their native language.						
Suggested Technological Innovations/ Use:						

Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia, Kahoot, etc.

Teachers are encouraged to use electronic assessments to determine mastery of concepts taught.

Demonstration of the graphing calculator, and student use of the graphing calculator should be mandatory.

### **Cross Curricular/ 21st Century Connections:**

9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

#### Sayreville Public Schools Algebra II Honors – 5 Credits **Unit 9: Sequences and Series**

**Summary of the Unit:** Students will explore sequences and series. They will define explicit rules that generate number sequences whose terms have a common difference or common ratio, and will use summation notation to represent and find the sum of the terms in a series. They will use rules for the sum of arithmetic series, finite geometric series, and infinite geometric series. Also, students will define recursive rules for generating arithmetic and geometric sequences

**Enduring Understanding:** Arithmetic sequences have a common difference, and geometric sequences have a common ratio. The sum of the terms in a sequence is called a series. Rules for generating arithmetic sequences or geometric sequences can be explicit or recursive.

**Essential Questions:** What is the difference between an arithmetic sequence and a geometric sequence? How do you define a sequence explicitly? How do you find the sum of a series? How do you define a sequence recursively?

**Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit.** Section Quizzes, End of Unit Tests, and End of Quarter Exam

**Resources:** Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards

<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning
				Assessments	Standards
Define and Use	2 days	Define and use	Define a sequence	Check student	HS F.IF.3
Sequences and		sequences and	as a function whose	understanding via	HS F.BF.1a
Series		series.	domain is a set of	oral participation.	HS F.BF.2
			consecutive		
			integers. The values	Check student	
			of the sequence are	work.	
			called terms of the		
			sequence. A	Classwork	
			sequences can be	assigned.	
			finite or infinite.		
				Homework	
			Provide practice	assigned.	
			problems of writing		
			the terms in a		
			sequence given a		

		Algebra II Ho	nors – 5 Credits		[
			rule, and of		
			identifying a pattern		
			in a sequence and		
			trying to write a		
			rule.		
			Define series and		
			summation notation.		
			Series can be wither		
			finite or infinite.		
			Provide practice		
			problems of writing		
			series in summation		
			notation, and finding		
			the sums of series.		
			As time permits		
			show formulas for		
			special series and		
			world problems		
Analyze Arithmetic	2 days	Identify arithmetic	Define arithmetic	Check student	HS F BF 2
Sequences and	- <i>auj</i> -	sequences	sequence and	understanding via	HSFLE2
Series		sequences.	common difference	oral participation	FLA-
Series		Write explicit rules	common uniciciee.	oral participation.	LITERACY RST 9-
		for arithmetic	Practice writing	Check student	10 /
		sequences	explicit rules for	work	10.4
		sequences.	arithmetic sequences	WOIK.	
		Find the sum of a	(given the first few	Classwork	
		finite arithmetic	terms or given a	assigned	
			torm and a common	assigned.	
		501108.	difference, or given	Homowork	
			two torms)	aggigrad	
			two terms).	assigned.	
1	1	1	1	1	

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	1	Algebra II Ho	<u>nors – 5 Credits</u>	1	
			Define arithmetic		
			series and derive the		
			formula for the sum		
			of a finite arithmetic		
			series.		
			Use the formula to		
			find the sum of a		
			finite arithmetic		
			series given a		
			problem written in		
			summation notation		
			form		
			101111.		
			As time permits		
			As time permits,		
			mehlama		
	2 davia		Define exercite		
Analyze Geometric	2 days	Identify geometric	Define geometric	Check student	H5 A.55E.4
Sequences and		sequences.	sequence and	understanding via	HS F.BF.2
Series		<b>TTT 1</b>	common ratio.	oral participation.	HS F.LE.2
		Write explicit rules			ELA-
		for geometric	Practice writing	Check student	LITERACY.RST.9-
		sequences.	explicit rules for	work.	10.4
			geometric sequences		
		Find the sum of a	(given the first few	Classwork	
		finite geometric	terms, or given a	assigned.	
		series.	term and a common		
			ratio, or given two	Homework	
			terms).	assigned.	
			Define compatrie		
			Define geometric		
			series and derive the		
			series and derive the formula for the sum		
			series and derive the formula for the sum of a finite geometric		

		Algebra II Ho	nors – 5 Creatis		
			Use the formula to find the sum of a finite geometric series, given a problem written in summation notation form. As time permits, include word problems.		
Finding Sums of Infinite Geometric Sequences	2 days	Find the sum of an infinite geometric sequence, if it exists.	Define a partial sum of an infinite geometric series. Use the example of $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$ $+ \frac{1}{32} + \dots$ , find the first 5 partial sums, to show that the partial sums approach a limit. Derive the Sum of an Infinite Geometric Series formula, and discuss when a sum does not exist. Provide practice problems in summation notation	Check student understanding via oral participation. Check student work. Classwork assigned. Homework assigned.	HS A.SSE.3 ELA- LITERACY.RST.9- 10.4

	1	Algebra II Ho	nors – 5 Credits		
			form, and as an		
			expanded series.		
			As time permits,		
			include word		
			problems, such as		
			the total distance a		
			pendulum swings.		
Using Recursive	2 days	Write recursive	Explain the	Check student	HS F.IF.3
Rules		rules for arithmetic	difference between	understanding via	HS F.BF.1a
		and geometric	explicit and	oral participation.	HS F.BF.2
		sequences.	recursive rules.		ELA-
				Check student	LITERACY.RST.9-
		Write a recursive	Explain the notation	work.	10.4
		rule for special	used in recursive		
		sequences, such as	rules.	Classwork	
		the Fibonacci		assigned.	
		sequence.	Provide practice		
			problems for writing	Homework	
			recursive rules for	assigned.	
			arithmetic and		
			geometric		
			sequences, and for		
			special sequences,		
			such as the		
			Fibonacci sequence.		
			Include word		
			problems, as time		
			permits.		
Review and Assess	2 days	Review sequences	Provide review	Circulate during	HS F.IF.3
Sequences and		and series.	problems on	review to assist	HS F.BF.1a
Series			sequences and	students.	HS F.BF.2
			series.		

Algebra II Holiois – 5 Credits					
		Assess student	Assessment to last	Assessment to last	ELA-
		understanding of	all period.	all period.	LITERACY.RST.9-
		above topics.			10.4

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

Students will be allowed to submit assignments using additional time per IEP modifications.

Students will be encouraged to use different size and type of font in order to avoid print confusion.

LEP students will be allowed to use an internet translator or language glossary in order to translate vocabulary and assignments properly.

LEP students may be allowed to work with another student who is fluent in their native language.

#### Suggested Technological Innovations/ Use:

Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia, Kahoot, etc.

Teachers are encouraged to use electronic assessments to determine mastery of concepts taught.

Demonstration of the graphing calculator, and student use of the graphing calculator should be mandatory.

#### **Cross Curricular/ 21st Century Connections:**

9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.
#### Sayreville Public Schools Algebra II Honors – 5 Credits **Unit 10: Probability**

**Summary of the Unit:** In this unit, students will study the Fundamental Counting Principle, permutations (with and without repetition), and combinations (simple or multiple events). They will then study probability and odds, and how to construct a probability distribution. They will then study when is it appropriate to multiply probabilities vs. add probabilities.

**Enduring Understanding:** There are many different ways to count the number of possibilities, but it depends on whether or not order matters. Probabilities can also be computed, but you must be mindful of whether events are independent or dependent. When adding probabilities, you must be aware whether events are mutually exclusive or inclusive.

Essential Questions: When do I use a permutation vs. a combination? When do I multiply probabilities vs. add probabilities? Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

Resources: Glencoe Algebra 2 New Jersey Edition (©2005) and New Jersey Student Learning Standards

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/	New Jersey Student Learning
				Assessments	Standards
The Counting Principle	2 days	Use the Fundamental Counting Principle.	Define key vocabulary such as outcome, sample space, event, and independent vs. dependent.	Check student understanding via oral participation. Check student work.	HS MP.4 ELA- LITERACY.RST.9- 10.5
			Introduce the idea of ways to count by hand, such as with a tree diagram or a table.	Classwork assigned. Homework assigned.	
			Introduce the Fundamental Counting Principle, and provide practice		

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	1	Algebra II Ho	nors – 5 Credits		
			problems using it		
			(both independent		
			and dependent		
			events).		
Permutations and	2 days	Solve problems	Define a	Check student	HS S.CP.B.9
Combinations		using permutations	permutation and	understanding via	ELA-
		and permutations	introduce factorial	oral participation.	LITERACY.RST.9-
		with repetition.	notation.		10.4
		1		Check student	
		Solve problems	Introduce the	work.	
		using combinations	permutation		
		and combinations	formula, and show	Check for correct	
		with multiple	how to use it in the	use of graphing	
		events	graphing calculator	calculator	
		e vents.	graphing calculator.	calculator.	
			Show the formula	Classwork	
			for permutation with	assigned	
			ronotition and	assigned.	
			repetition, and	Homowork	
			provide practice	Homework	
			problems to use it.	assigned.	
			Define a		
			combination		
			comoniation.		
			Introduce the		
			combination		
			formula, and show		
			how to use it in the		
			graphing calculator		
			or appring curculation.		
			Provide practice		
			problems with		
			simple events and		
			multiple events, and		
			muniple events.		

Probability and 2 days Indicate probability Define probability Check student HS_SCPA	1
I holdonity and 2 angs I haleate probability Define probability, Check student IID 5.01.11	t t
Odds of success or success, and failure. understanding via HS S.CP.B	)
failure. Probability is oral participation. HS S.MD.A	3
always over total.	
Indicate odds of Probability is a Check student	
success or failure. number between 0 work.	
and 1, inclusive.	
Read and create a Check for correct	
probability Do a simple use of graphing	
distribution. probability problem, calculator.	
such as, "When two	
coins are tossed, Classwork	
what is the assigned.	
probability that both	
are tails?", where Homework	
the total number of assigned.	
outcomes can be	
counted quickly.	
Move to more	
complicated	
problems involving	
combinations and/or	
multiplying	
probabilities.	
Define odds, and do	
a word problem	
involving odds.	
Describe a	
Describe a probability	
distribution First	
do a simple one with	
a uniform	
distribution (the	

		Algebra II Ho	nors – 5 Credits		
			probability of		
			rolling each of the 6		
			numbers on a die is		
			1/6), then work		
			together to construct		
			a more complicated		
			one (the probability		
			of rolling two dice		
			and getting a sum of		
			2 through 12 is NOT		
			uniform).		
Multiplying	2 days	Understand why	Provide notes that:	Check student	HS S.CP.A.2
Probabilities		and when to	If 2 events are	understanding via	ELA-
		multiply	independent, then	oral participation.	LITERACY.RST.9-
		probabilities, and	the probability of		10.5
		compute multiplied	both events	Check student	
		probabilities	happening is the	work.	
		correctly.	product of the two		
			independent	Check for correct	
			probabilities.	use of graphing	
			Practice problems	calculator.	
			together, and extend		
			the above to more	Classwork	
			than two	assigned.	
			independent events.	-	
				Homework	
			Provide notes about	assigned.	
			dependent events. If		
			two events are		
			dependent, then the		
			probability of both		
			events happening is		
			the probability of		
			the first event		
			multiplied by the		

		Algebra II Ho	nors – 5 Credits		
			probability of the second event, following the first event happening. Practice problems together.		
Adding Probabilities	2 days	Understand why and when to add probabilities, and compute added probabilities correctly.	Define simple event, compound event, mutually exclusive, and inclusive. Provide notes that: If two events are mutually exclusive, then the probability of either the first or the second event occurs is the sum of their probabilities. Model problems before providing practice problems. Provide notes that: If two events are inclusive, then the probability of either the first or the second event occurs is the sum of their probabilities decreased by the probability of both occurring. Model problems before	Check student understanding via oral participation. Check student work. Check for correct use of graphing calculator. Classwork assigned. Homework assigned.	HS S.CP.B.7 ELA- LITERACY.RST.9- 10.5

		Algebra II Ho	liois – 5 Cleans		1
			providing practice		
			problems.		
Review and Assess	3 days	Review probability	Provide review	Circulate during	HS MP.4
Probability		(all types).	problems on	review to assist	HS S.CP.B.7
			probability (all	students.	HS S.CP.B.9
		Assess student	types).		HS S.CP.A.2
		understanding of		Assessment to last	HS S.CP.A.4
		above topics.	Assessment to last	all period.	ELA-
			all period.		LITERACY.RST.9-
					10.4
					ELA-
					LITERACY.RST.9-
					10.5
Suggested Modifica	tions for Special Edu	cation, English Lang	uage Learners and Git	fted Students:	
Students will be allow	wed to submit assignm	ents using additional t	ime per IEP modification	ons.	
Students will be enco	ouraged to use differen	t size and type of font	in order to avoid print of	confusion.	
LEP students will be	allowed to use an inte	rnet translator or langu	age glossary in order to	o translate vocabulary	and assignments
properly.					-
LEP students may be	allowed to work with	another student who is	s fluent in their native l	anguage.	
Suggested Technolo	gical Innovations/ Us	se:			
Instructional technology	ogy, where available, s	should be used to prese	ent and assess lessons su	uch as; PowerPoint, SN	MART Board, Quia,
Kahoot, etc.		-			_
Teachers are encoura	ged to use electronic a	assessments to determine	ne mastery of concepts	taught.	
Demonstration of the	graphing calculator, a	and student use of the g	graphing calculator show	uld be mandatory.	
Cross Curricular/ 2	1 <sup>st</sup> Century Connecti	ons:		•	
9.1 21st Century Life	e and Career Skills: A	All students will den	nonstrate the creative	, critical thinking, co	ollaboration, and
problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and					
organizational cultures					
02 21st Contures Life and Caroor Skills: Poreonal Financial Literacy: All students will develop skills and strategies that					
<sup>32</sup> 21 <sup>-</sup> Century Life and Career Skins. Tersonal Financial Enteracy. An students will develop skins and strategies that					
promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving					
in the global economy.					
9.3 21 <sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply					
knowledge about a	nd engage in the pro	ocess of career aware	eness, exploration, an	d preparation in ord	er to navigate the
globally competitiv	<u>ve work environmen</u>	t of the information a	age.		

# **Unit 11: Data Analysis and Statistics**

**Summary of the Unit:** Students will examine the patterns found in Pascal's triangle and apply these patterns to binomial expansions. They will extend their understanding of probability distributions and measures of central tendency to the study of normal distributions. Students will then study sampling methods for collecting data, how to identify biased samples, and how to calculate a margin of error. Finally, they will compare surveys, experiments, and observational studies.

**Enduring Understanding:** In everyday reading, statistics and data analysis can be encountered. Knowing whether a sample is biased or unbiased can help given the reader a better ways to understand what they are reading. In polling reports, margin of error is often encountered, and knowing what it means again will help the reader.

**Essential Questions:** What is a binomial distribution? Where are the values in a normal distribution that rarely occur displayed on a normal curve? What should be true of the sample when you conduct a survey? How do you collect data that accurately represents a population?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit.							
Section Quizzes, End	l of Unit Tests, and En	nd of Quarter Exam	-				
Resources: Larson	Resources: Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards						
<b>Topic/ Selection</b>	Suggested	General	Instructional	Suggested	New Jersey		
	Timeline per topic	Objectives	Activities	Benchmarks/	Student Learning		
				Assessments	Standards		
Use Combinations	1 day	Use the Binomial	Introduce Pascal's	Check student	HS A.APR.5		
and the Binomial		Theorem to expand	Triangle using	understanding via	ELA-		
Theorem		a power of a	numbers, and then	oral participation.	LITERACY.RST.9-		
		binomial expression	using combinations.		10.4		
		completely, or to		Check student			
		find a specific term	Solve problems such	work.			
		in the expansion.	as "How many				
			different	Classwork			
			combinations of 2	assigned.			
			Model UN members	-			
			can be chosen from	Homework			
			the 6 Model UN	assigned.			
			students in the	_			

	1	Algebra II Ho	nors – 5 Credits		
			club?" using Pascal's		
			Triangle (confirm		
			with combinations).		
			Then expand $(II +$		
			$\mathbb{R}^{n}$ for n=0, 1, 2, 3,		
			and 4, and show		
			that the coefficients		
			match Pascal's		
			Triangle		
			i nungio.		
			Introduce the		
			Binomial Theorem.		
			then use it to expand		
			$(\mathbb{R}^2 + \mathbb{R}^2)^3$ and other		
			practice problems		
			practice problems.		
			As time permits.		
			find specific terms		
			or coefficients of		
			terms, using		
			knowledge of the		
			Binomial Theorem		
Construct and	2 days	Construct and	Revisit probability	Check student	HS S.MD.3
Interpret Binomial		interpret binomial	distributions from	understanding via	ELA-
Distributions		distributions	"Probability"	oral participation.	LITERACY.RST.9-
			section (roll on one	1 1	10.4
			die, vs. sum on the	Check student	
			rolls of two dice)	work.	
			Define a binomial	Classwork	
			experiment. and	assigned.	
			provide the formula	6	
			for the probability of	Homework	
			k successes.	assigned.	

		Algebra II Ho	onors – 5 Credits		1
			Construct a binomial distribution using an example such as: "According to a survey, about 41% of U.S. households have a soccer ball. Suppose you ask 6 randomly chosen U.S. households whether they have a soccer ball. Draw a histogram of the binomial distribution for your survey." Define symmetric vs. skewed, show pictures of both types to ensure students can see the difference.		
Use Normal Distributions	2 days	Use normal distributions, or <i>z</i> - scores and the standard normal table to find probabilities.	Introduce another type of probability distribution called the normal distribution. A normal curve is a bell-shaped curve that is symmetric about the mean of the data.	Check student understanding via oral participation. Check student work. Classwork assigned.	HS S.ID.4 ELA- LITERACY.RST.9- 10.4

	Algebra II Hoi	nors – 5 Credits		
			Homework	
		Provide notes about	assigned.	
		the area under the	0	
		normal curve and		
		the probability (two		
		different ways of		
		interpreting the		
		araph)		
		graph).		
		Dreatics reading		
		probabilities off of		
		the normal curve.		
		Then, move to a real		
		world examples that		
		can be solved using		
		the normal curve.		
		Introduce another		
		way to read the		
		standard normal		
		curve using a 7-		
		score		
		Provide the formula		
		for a z-score and		
		nractice using the 7-		
		score to read the		
		stondard normal		
		stanuaru norman		
		ladie.		
		ר (' 1 11		
		Practice real world		
		problems that can be		
		solved using <i>z</i> -		
		scores and the		

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		Algebra II Ho	nors – 5 Credits		
			standard normal		
			table.		
Select and Draw Conclusions from Samples	1 day	Select and draw conclusions from samples.	table. Define population and subset of the population (sample). Define different sample types: self- selected, systematic, convenience and random sample. Provide exercises to classify samples. Define biased vs unbiased sample - and provide exercises in	Check student understanding via oral participation. Check student work. Classwork assigned. Homework assigned.	HS S.IC.1 HS S.IC.3 HS S.IC.4
			identifying a biased sample. Describe how to choose an unbiased sample, and practice developing ways to choose an unbiased sample. Provide margin of error formula, and practice determining the margin of error for a given sample size, and finding the correct sample size		

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Algebra II Honora	5 Cradita

E Contraction of the second se			$f_{\text{constraints}}$		
			for a given margin		
			of error.		
Compare Surveys,	1 day	Compare surveys,	Provide notes that	Check student	HS S.IC.1
Experiments, and		experiments, and	surveys may have	understanding via	HS S.IC.3
Observational		observational	biased questions	oral participation.	HS S.IC.6
Studies		studies.	(define biased).		
			Practice identifying	Check student	
			and correcting	work.	
			biased questions.		
			1	Classwork	
			Define experiment	assigned.	
			vs. observational		
			study. Practice	Homework	
			identifying	assigned.	
			examples of each		
			kind.		
			Define controlled		
			experiment, control		
			group and treatment		
			group, and		
			randomized		
			comparative		
			experiment. Practice		
			determining if a		
			given situation is a		
			randomized		
			comparative		
			experiment.		
Review and Assess	2 days	Review data	Provide review	Circulate during	HS S.IC.1
Data Analysis and		analysis and	problems on data	review to assist	HS S.IC.3
Statistics		statistics.	analysis and	students.	HS S.IC.4
			statistics.		HS A.APR.5
				Assessment to last	HS S.MD.3
				all period.	HS S.ID.4

Algebra II Honors – 5 Credits							
		Assess student	Assessment to last				
		understanding of	all period.	*Quarterly 4			
		above topics.	-	Assessment			
		1		material ends here.			

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

Students will be allowed to submit assignments using additional time per IEP modifications.

Students will be encouraged to use different size and type of font in order to avoid print confusion.

LEP students will be allowed to use an internet translator or language glossary in order to translate vocabulary and assignments properly.

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92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

#### Algebra II Honors – 5 Credits

## **Unit 12: Quadratic Relations and Conic Sections (continued) – as time permits**

**Summary of the Unit:** Students will start by applying distance and midpoint formulas, then learn how to graph and write equations of circles, ellipses and hyperbolas (they studied parabolas earlier in the year). They will investigate translations of conics.

**Enduring Understanding:** Conics sections are formed when a plan intersects a double cone. Depending on the angle of the plane, a circle, parabola, ellipse or hyperbola is created. Conic section can be centered at the origin, or be translated.

**Essential Questions:** Where does the distance formula come from? What are the general forms of questions for circle, ellipses, and hyperbolas centered at the origin? What are the general forms of questions for circle, ellipses, and hyperbolas NOT centered at the origin?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Section Quizzes, End of Unit Tests, and End of Quarter Exam

**Resources:** Larson Algebra 2 Common Core Edition (©2012) and New Jersey Student Learning Standards

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/	New Jersey Student
				Assessments	Learning Standards
Apply the Distance	1 day	Apply the distance	Derive the distance	Check student	HS G.GPE.4
and Midpoint		and midpoint	formula from the	understanding via	HS G.GPE.7
Formulas		formulas	Pythagorean	oral participation.	
			Theorem.		
				Check student	
			Practice using the	work.	
			distance formula.		
				Classwork	
			Provide the	assigned.	
			midpoint formula		
			and practice	Homework	
			problems to work	assigned.	
			on.		

Algebra II Honors – 5 Credits						
Graph and Write	3 days (includes	Graph and write	Provide standard	Check student	HS G.GPE.1	
Equations of	assessment)	equations of circles.	equation of a circle	understanding via	HS A.REI.10	
Circles			with center at the	oral participation.		
			origin. Practice			

Algebra II Honors – 5 Credits							
		<u> </u>	writing equations,	Check student work			
			and graphing circles	and graphs.			
			centered at the				
			origin.	Classwork			
				assigned.			
			Then provide				
			equation for a circle	Homework			
			translated away	assigned.			
			from the origin.	e			
			Practice writing	Ouiz covering these			
			equations, and	topics.			
			graphing circles				
			NOT centered at the				
			origin				
			ongini				
			Use completing the				
			square to convert an				
			equation of a circle				
			in expanded form to				
			standard form.				
Graph and Write	4 days (includes	Graph and write	Provide standard	Check student	HS G.GPE.3		
Equations of	assessment)	equations of	equation of an	understanding via	HS A.REI.10		
Ellipses		ellipses.	ellipse with center at	oral participation.			
			the origin. Practice				
			writing equations,	Check student work			
			and graphing	and graphs.			
			ellipses centered at				
			the origin.	Classwork			
				assigned.			
			Then provide				
			equation for an	Homework			
			ellipse translated	assigned.			
			away from the				
			origin. Practice	Ouiz covering these			
			writing equations,	topics.			

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		-	and graphing			
			ellipses NOT			
			centered at the			
			origin.			
			Use completing the			
			square to convert an			
			equation of an			
			ellipse in expanded			
			form to standard			
			form.			
Graph and Write	4 days (includes	Graph and write	Provide standard	Check student	HS G.GPE.3	
Equations of	assessment)	equations of	equation of a	understanding via	HS A.REI.10	
Hyperbolas		hyperbolas.	hyperbola with	oral participation.		
			center at the origin.			
			Practice writing	Check student work		
			equations, and	and graphs.		
			graphing hyperbolas			
			centered at the	Classwork		
			origin.	assigned.		
			8	0		
			Then provide	Homework		
			equation for a	assigned.		
			hyperbola translated	C		
			away from the	Ouiz covering these		
			origin. Practice	topics.		
			writing equations,			
			and graphing			
			hyperbolas NOT			
			centered at the			
			origin.			
			Use completing the			
			square to convert an			
			equation of a			

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	 hyperbola in	
	expanded form to	
	standard form.	

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

Students will be allowed to submit assignments using additional time per IEP modifications.

Students will be encouraged to use different size and type of font in order to avoid print confusion.

LEP students will be allowed to use an internet translator or language glossary in order to translate vocabulary and assignments properly.

LEP students may be allowed to work with another student who is fluent in their native language.

### Suggested Technological Innovations/ Use:

Instructional technology, where available, should be used to present and assess lessons such as; PowerPoint, SMART Board, Quia, Kahoot, etc.

Teachers are encouraged to use electronic assessments to determine mastery of concepts taught.

Demonstration of the graphing calculator, and student use of the graphing calculator should be mandatory.

## **Cross Curricular/ 21st Century Connections:**

9.1 21<sup>st</sup> Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

92 21<sup>st</sup> Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

93 21<sup>st</sup> Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

\*\*If time remains at the end of the year, consider extending studies in trigonometry, such as inverse trigonometry, Law of Sines, Law of Cosines, solving trigonometric equations, writing trigonometric functions and model, Sum and Difference Formulas, and Double-Angle and Half-Angle formulas.\*\*