Hillsborough Township Public Schools
Mathematics Department
Algebra 3 and Trigonometry Curriculum Map

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
Unit 1 - Linear Equations, Inequalities, and Applications **Pacing: 18 days**						Common Unit Test		
How can change be best represented mathematically?	Algebraic representation can be used to generalize patterns and relationships.	Creating Equations MP 4 – Model with Mathematics MP 5 – Use appropriate tools strategically.	Create equations that describe numbers or relationships	A-CED.A.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	Solve linear and polynomial inequalities.	Solve: $-3x + 8 \geq 15$ $x^2 + 7x + 7 < 15$		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?	Algebraic representation can be used to generalize patterns and relationships.	Creating Equations MP 1 – Make sense of problems and persevere in solving them. MP 6 – Attend to precision.	Create equations that describe numbers or relationships	A-CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on	Solve linear and polynomial inequalities	(a) Solve and express solution in interval notation: $-1 < \frac{4}{2-x} \leq \frac{1}{5}$ (b) If a person registers a 0.08 blood alcohol level, a D.U.I. ticket will be issued almost anywhere in the continental U.S. If the test is accurate within 0.007, write a linear inequality representing an actual blood	L.11-12.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies.	

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				combinations of different foods.		alcohol level that will not be issued a ticket.		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Reasoning with Equations and Inequalities MP 7 – Look for and make use of structure. MP 8 – Look for and express regularity in repeated reasoning.	Understand solving equations as a process of reasoning and explain the reasoning	A-REI.A.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumptions that the original equation has a solution. Construct a viable argument to justify a solution method.	Solve linear equations by using properties of equality.	-30 + 3c – 7(2-3c) = 4(c-5) + 3c + 27		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Reasoning with Equations and Inequalities MP 4 – Model with mathematics.	Solving equations and inequalities in one variable	A-REI.B.3 - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Model given situations with linear equations	In your algebra class your first 4 exam grades were 72, 65, 69, and 70. What is the lowest score you can earn on the fifth exam t earn a C (70%) for the course? Assume all exams have equal weight.	L.11-12.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies.	

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How do mathematical ideas interconnect and build on one another to produce a coherent whole?	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.	Seeing Structure in Expressions MP 1 – Make sense of problems and persevere in solving them. MP 4 – Model with mathematics.	Interpret the structure of expressions	A-SSE.A.1. - Interpret expressions that represent a quantity in terms of its context.*	Translate from words to mathematical expressions.	At the very first Indianapolis 500-mile race in 1911, Ray Harroun won in a time of 6.7 hours. What was his average speed in miles per hour, rounded to the nearest tenth?		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.	Seeing Structure in Expressions MP 1 – Make sense of problems and persevere in solving them. MP 4 – Model with mathematics.	Interpret the structure of expressions	A-SSE.A.1b - Interpret complicated expressions by viewing one or more of their parts as a single entity.	Write equations from given information.	The length of one side of a triangle is 3 cm less than twice the first side, and the length of the third side is 5 cm more than the length of the first side. If the perimeter of the triangle is 22 cm, find the length of each side of the triangle.		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?	The symbolic language of algebra is used to communicate and generalize the patterns in mathematics.	Number and Quantities MP 4 – Model with mathematics. MP 5 – Use appropriate tools strategically.	Reason Quantitatively and use units to solve problems	N-Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose	Use problem-solving strategies to solve percent and investment problems.	Gail Brown invested some money at 9% and $100 more than at 6%. Her total annual interest was $96. How much did she invest at each rate?		9.4.12.F.4 - Solve mathematical problems to obtain information for decision-making in financial settings.

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				and interpret the scale and the origin in graphs and data displays.				
Unit 2 - Graphs, Linear Equations, and Functions Pacing: 13 days						Common Unit Test		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?	Algebraic representation can be used to generalize patterns and relationships.	Creating Equations MP 4 – Model with mathematics.	Create equations that describe numbers or relationships	A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Create and solve linear equations in two variables.	At a deli, Freida bought spicy turkey and aged provolone cheese. The turkey costs $6.32/pound and the cost of the cheese is $4.27/pound. In total, she bought 3.2 pounds at the deli counter for a total cost of $17.56 How many pounds of each did she buy?		
How can we use physical models to clarify mathematical relationships?	Physical models can be used to clarify mathematical relationships.	Reasoning with Equations and Inequalities MP 5 – Use appropriate tools strategically.	Represent and solve equations and inequalities graphically	A-REI.D.10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	Graph a function on a coordinate plane given its equation by using a table of values	Graph the equation y = 2x +1 by using a table of values.		
How are patterns of change related	Patterns and relationships can be represented	Interpreting Functions	Analyze functions	F-IF.C.7a - Graph linear and quadratic functions	3.3 ,3.4, 3.5 - Graph linear equations and	Find the equation in slope-intercept form of the line		

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to the behavior of functions?	graphically, numerically, symbolically, or verbally.	MP 5 – Use appropriate tools strategically.	using different representations	and show intercepts, maxima, and minima.	inequalities given the slope and y-intercept.	with slope 5 and y-intercept 15, and graph it.		
How are patterns of change related to the behavior of functions?	Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.	Interpreting Functions MP 1 – Make sense of problems and persevere in solving them. MP 7 – Look for and make use of structure.	Analyze functions using different representations	F-IF.C.8 - Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	3.1, 3.3 - Write the equation of a line in slope-intercept or point-slope form	Write the equation of a line that goes through the points (3, 4) and (5, 8) in point-slope form.		
How can change be best represented mathematically?	Algebraic representation can be used to generalize patterns and relationships.	Building Functions MP 4 – Model with mathematics.	Build a function that models a relationship between two quantities	F-BF.A.1 - Write a function that describes a relationship between two quantities.*	3.3 - Write an equation of a line that models real data	A membership in the Midwest Athletic Club costs $99 plus $39. Let x represent the number of months selected. How much does the first year's membership cost?		9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.

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What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 2 – Reason abstractly and quantitatively. MP 5 – Use appropriate tools strategically.	Represent and solve equations and inequalities graphically	A-REI.D.12 - Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	3.4 - Graph linear inequalities in two variables and their intersection	Graph the compound inequality: $6x - 4y < 10$ and $y > 2$		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?	Algebraic representation can be used to generalize patterns and relationships.	Interpreting Functions MP 3 – Construct viable arguments and critique the reasoning of others.	Understand the concept of a function and use function notation	F-IF.A.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input x. The graph of *f* is the graph of the equation *y=f(x)*.	3.5 - Define and identify relations and functions	Tell whether each relation defines a function. {(5, 1), (3, 2), (4, 9), (7, 6)}		

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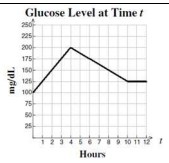
How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Interpreting Functions MP 1 – Make sense of problems and persevere in solving them.	Understand the concept of a function and use function notation	F-IF.A.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of context.	3.5 - Use function notation to evaluate functions	If $f(x) = x^2 + 4x - 1$, find f(x+1).		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?	Algebraic representation can be used to generalize patterns and relationships.	Interpreting Functions MP 2 – Reason abstractly quantitatively. MP 3 – Construct viable arguments and critique the reasoning of others.	Interpret functions that arise in applications in terms of the context	F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts, intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end*	3.1 - Interpret a line graph	 The graph shows the blood sugar levels of a diabetic person being monitored over a twelve hour period. For how long is the diabetic's blood sugar level decreasing?	RST.11-12.7 - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	

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				*behavior; and periodicity.**				
How can we use mathematical models to describe physical relationships?	Physical models can be used to clarify mathematical relationships.	Interpreting Functions MP 3 – Construct viable arguments and critique the reasoning of others.	Interpret functions that arise in applications in terms of the context	F-IF.B.5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function* h(n) *gives the number of person-hours it takes to assemble* n *engines in a factory, then the positive integers would be an appropriate domain for the function.**	Find the domain of a function given its equation and then explain why it's true looking at the graph	1. Given the function y $=\sqrt{x-3}$, (a) Find the domain. State your answer in interval notation. (b) Graph the function and explain why the domain is true using the graph. 2. An open box is constructed from a square 10-inch piece of cardboard by cutting squares of length x out of each corner and folding the sides up. Express the volume of the box as a function of x and state the domain.	WHST.9.10.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
How can we decide when to use an exact answer and when to use an estimate?	Context is critical when using estimation.	Interpreting Functions	Interpret functions that arise in applications in terms of the context	F-IF.B.6 - Calculate and interpret the average rate of change of a function (presented	3.2 - Solve problems involving average rate of change	A hill has a slope 0.05. How many feet in the vertical direction correspond to a run of 50 ft?		

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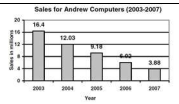
		MP 2 – Reason abstractly and quantitatively. MP 3 – Construct viable arguments and critique the reasoning of others.		symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*				
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Interpreting Functions MP 3 – Construct viable arguments and critique the reasoning of others. MP 4 – Model with mathematics.	Analyze functions using different representations	F-IF.C.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*	3.3 - Write an equation of a line that models real data.	 Use the information for the years 2003 and 2007 to find an equation that models the data. Let x = 3 represent 2003, x = 7 represent 2007, and y represent the total sales in millions of dollars. Write the equation in slope-intercept form.	SL.11-12.5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	
How are patterns of change related to the behavior of functions?	Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.	Linear and Exponential Models* MP 4 – Model with mathematics.	Construct and compare linear and exponential models and solve problems	F-LE.A.2 - Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or	3.3 - Write an equation of a line parallel or perpendicular to a given line	Write the equation of a line that is perpendicular to the line 3x + 2y = 9 and goes through the point (7,2).		

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				two input-output pairs (including reading these from a table).				
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Linear and Exponential Models* MP 2 – Reason abstractly and quantitatively. MP 3 – Construct viable arguments and critique the reasoning of others.	Interpret expressions for functions in terms of the situation they model	F-LE.B.5 - Interpret the parameters in a linear or exponential function in terms of a context.	3.2, 3.3 - Interpret the solution to rate of change problems in terms of its context	BOOK PUBLISHERS' SALES Year / Sales (in millions) 1995 / 19,000 1996 / 20,000 1997 / 21,000 1998 / 22,000 1999 / 23,000 2000 / 24,000 *Source:* Book Industry Study Group. The table gives book publishers' approximate net dollar sales (in millions) from 1995 through 200. Find the average rate of change for 1995-1996, and 1995-1999. What do you notice about the answers and what does it tell you?	L.11-12.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies.	9.4.12.O.(2).5 - Demonstrate critical thinking abilities and skills needed to review information, to explain statistical analyses, and to translate, interpret, and summarize research and statistical data collected and analyzed as the result of an investigation.
What situations can be analyzed using transformations and symmetries?	Shape and area can be conserved during mathematical transformations.	Congruence MP 4 – Model with mathematics. MP 6 – Attend to precision.	Experiment with transformations in the plane	G-CO.A.1 - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	3.2 - Use slopes to determine if two lines are parallel, perpendicular, or neither	Determine whether each pair of lines is parallel, perpendicular, or neither. $2x + 5y = -7$ and $5x - 2y = 1$		

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Unit 3 - Systems and Matrices **Pacing: 16 days**						Common Unit Test		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Expressing Geometric Properties with Equations MP 7 – Look for and make use of structure.	Translate between the geometric description and the equation for a conic section	G.GPE.A.1 - Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	13.1 - Find the equation of a circle given the center and radius.	Find the equation of a circle satisfying the given conditions. Center: (-4,3) Radius: 2		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Vector and Matrix Quantities MP 4 – Model with mathematics.	Perform operations on matrices and use matrices in applications.	NVM.C.6 (+) - Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships to a network.	4.4 - Use matrices in application problems.	At the grocery store, Miguel bought 4 quarts of milk, 2 loaves of bread, 4 potatoes, and an apple. Mary bought 2 quarts of milk, a loaf of bread, 5 potatoes, and 4 apples. Write this information first as a 2 x 4 and then as a 4 x 2 matrix.	L.11-12.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies.	
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Vector and Matrix Quantities MP 6 – Attended to precision.	Perform operations on matrices and use matrices in applications.	NVM.C.7 (+) - Multiply matrices by scalars to produce new matrices, e.g., as when all the payoffs in a game are doubled.	4.4 - Multiply a matrix by a scalar.	$Let\ A = \begin{bmatrix} -2 & 4 \\ 0 & 3 \end{bmatrix}\ and\ B = \begin{bmatrix} -6 & 2 \\ 4 & 0 \end{bmatrix}$. Find 2A.		

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What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Vector and Matrix Quantities MP 6 – Attend to precision.	Perform operations on matrices and use matrices in applications.	NVM.C.8 (+) - Add, subtract, and multiply matrices of appropriate dimensions.	4.4 - Add and subtract matrices.	$Let\ A = \begin{bmatrix} -2 & 4 \\ 0 & 3 \end{bmatrix}\ and\ B = \begin{bmatrix} -6 & 2 \\ 4 & 0 \end{bmatrix}$. Find -2A + 4B		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways	Vector and Matrix Quantities MP 6 – Attend to precision.	Perform operations on matrices and use matrices in applications.	NVM.C.9 (+) - Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	4.4 - Know and apply the basic definitions for matrices.	Find the size of the matrix; identify any square, column, or row matrices. $\begin{bmatrix} -4 & 8 \\ 2 & 3 \end{bmatrix}$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations MP 2 – Reason abstractly and quantitatively. MP 6 – Attend to precision.	Create equations that describe numbers or relationships	A-CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities	Solve linear and polynomial inequalities	(a) Solve and express solution in interval notation: $-1 < 4/2 - x < 1/5$ (b) If a person registers a 0.08 blood alcohol level, a D.U.I. ticket will be issued almost anywhere in the continental U.S. If the test is accurate	L.11-12.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies.	9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.

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				describing nutritional and cost constraints on combinations of different foods.		within 0.007, write a linear inequality representing an actual blood alcohol level that will not be issued a ticket.		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Congruence MP 5 – Use appropriate tools strategically.	Experiment with transformations in the plane	G.CO.A.1 - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	13.1 - Recognize the equation of a circle	Graph each circle. Identify the center and radius. $(x + 3)^2 + (y - 2)^2 = 9$		
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 1 – Make sense of problems and persevere in solving them. MP 7 – Look for and make use of structure.	Solve systems of equations	A.REI.C.5 - Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	4.1 - Solve linear systems with two equations in two variables by elimination	Solve the system by elimination. $-2x + 3y = 1$ $-4x + y = -3$		
What makes an algebraic algorithm both	Algebraic and numeric procedures are interconnected	Reasoning with Equations and Inequalities	Solve systems of equations	A.REI.C6 - Solve systems of linear equations exactly and approximately	Solve systems of linear equations in	Given the system $3x – y = 1$ and $2x + y = 2$,		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and

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effective and efficient?	and build on one another to produce a coherent whole.	MP 7 – Look for and make use of structure.		(e.g., with graphs), focusing on pairs of linear equations in two variables.	two variables exactly and approximatel y	(a) Approximate the solution graphically. (b) Solve the system exactly algebraically.		trigonometric relationships, characteristics, and properties to solve problems.
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 7 – Look for and make use of structure.	Solve systems of equations	A.REI.C.7 - Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = -3x and the circle x2 + y2 = 3.	Solve a nonlinear system by substitution or elimination.	13.3 - Solve the system by the method of your choice. $y = 4x^2 - x$ $y = x$		
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 7 – Look for and make use of structure.	Solve systems of equations	A.REI.C8 (+) - Represent a system of linear equations as a single matrix equation in a vector variable.	Write a system of linear equations as a matrix equation.	Write the system of linear equations as a matrix equation and solve. 2x – y = 5 -x + 2y = 3		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
How can change be best represented mathematically?	The symbolic language of algebra is used to communicate and generalize	Reasoning with Equations and Inequalities	Solve systems of equations	A.REI.C9 (+) - Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using	Find the inverse of a matrix if it exists and use it to solve systems of	Solve each system by using the inverse of the coefficient matrix.		

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How can we best represent and verify geometric/algebraic relationships?	the patterns in mathematics. Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	MP 7 – Look for and make use of structure.		technology for matrices of dimension 3 x 3 or greater).	linear equations	$-x + y = 1$ $2x - y = 1$		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Reasoning with Equations and Inequalities MP 8 – Look for and express regularity in repeated reasoning.	Represent and solve equations and inequalities graphically	A.REI.D.11 - Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are liner, polynomial, rational, absolute value, exponential,	4.1 13.3 - Decide whether an ordered pair is a solution to a linear or nonlinear system	Decide whether the given ordered pair is a solution of the given system. x + y = 6 x - y =4 ; (5,1)		

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				and logarithmic functions.*				
Unit 4 – Exponents, Polynomials, and Polynomial Functions **Pacing: 13 days**						Common Unit Test		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Arithmetic with Polynomials and Rational Expressions MP 1 – Make sense of problems and persevere in solving them.	Perform arithmetic operations on polynomials	A-APR.A.1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract and multiply polynomials.	Add, subtract, multiply and divide polynomials and compose polynomials	5.2 5.4 5.5 - Given the two polynomials, add, subtract, multiply, and divide them. f(m)= $2m^2 + m - 10$ and g(m) = m - 2. Find f(g(m)).		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verify geometric/algebraic relationships.	Creating Equations MP 5 – Use appropriate tools strategically.	Create equations that describe numbers or relationships	A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Graph basic polynomial functions	5.3 - Graph the function f(x) = 3x +2.		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations	Create equations that describe numbers or relationships	A-CED.A.3 - Represent constraints by equations or inequalities, and by systems of	Use a polynomial function to model data	5.3 - The number of bank debit cards issued during the period from 1990 through 2000 can be modeled by the		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

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		MP 4 – Model with mathematics.		equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.		polynomial function defined by $P(x) = -0.31x^3 + 5.8x^2 - 15x + 9$, where x = 0 corresponds to the year 1990, x =1 corresponds to 1991, and so on, and P(x) is in millions. Use this function to approximate the number of bank debit cards issued in each given year.		
Unit 5 – Factoring **Pacing: 13 days**						Common Unit Test		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Seeing Structure in Expressions MP 7 – Look for and make use of structure.	Interpret the structure of expressions	A-SSE.A.2 - Use the structure of an expression to identify ways to rewrite it. For example, see x4 - y4 as (x2)2- (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 - y2)(x2 + y2).	6.1 – 5 - Factor a polynomial completely.	Factor each polynomial. $m^3 + m^2 - n^3 - n^2$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations MP 4 – Model with mathematics.	Create equations that describe numbers or relationships	A-CED.A.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising	6.5 - Solve applied problems that require the zero-factor property.	A farmer has 300 ft of fencing and wants to enclose a rectangular area of 5000 square feet. What dimensions should she use?		9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				from linear and quadratic functions, and simple rational and exponential functions.				solutions to real world problems.
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Reasoning with Equations and Inequalities MP 7 – Look for and make use of structure.	Solve equations and inequalities in one variable	A-REI.B.4 - Solve quadratic equations in one variable.	6.5 - Learn and use the zero-factor property.	Which equation is not in proper form for using the zero-factor property? Tell why it is not in proper form. a. (x+2)(x-6)=0 b. y(y-3)+6(y-3)=0		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Reasoning with Equations and Inequalities MP 1 – Make sense of problems and persevere in solving them. MP 6 – Attend to precision.	Solve equations and inequalities in one variable	A-REI.B.4.b - Solve quadratic equations by inspection (e.g., for x2 = 49, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula give complex solutions and write them as a ± bi for real numbers a and b.	6.5 - Solve a quadratic equation by using any factoring method.	Solve the equation. $y^3 - 6y^2 = -8y$		
Midterm Pacing: 1 day								

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Unit 6 - **Rational Expressions and Functions** **Pacing: 8 days**						Common Unit Test		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Seeing Structure in Expressions MP 2 – Reason abstractly and quantitatively.	Interpret the structure of expressions	A-SSE.A.2 - Use the structure of an expression to identify ways to rewrite it. For example, see x4 - y4 as (x2)2- (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 - y2)(x2 + y2).	7.1 7.2 7.4 - Add, subtract, and multiply rational expressions.	Add, subtract, and multiply the following expressions. $\frac{-2}{x-1}$ $\frac{2}{x+1}$		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways	Seeing Structure in Expressions MP 2 – Reason abstractly and quantitatively.	Write expressions in equivalent forms to solve problems MP 1 – Make sense of problems and persevere in solving them	A-SSE.B.3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	7.1 - Write rational expressions in lowest terms.	Write the expression in its lowest terms. $\frac{y^2 - 5y - 14}{y^2 + y - 2}$		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Arithmetic with Polynomials and Rational Expressions MP 8 – Look for and express regularity in repeated reasoning.	Rewrite rational expressions MP 6 – Attend to precision.	A-APR.D.6 - Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with	7.1 7.2 - Divide rational expressions.	Perform the indicated operation. $\frac{a^3 - b^3}{a^2 - b^2} \div \frac{2a - 2b}{2a + 2b}$		

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.				
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Arithmetic with Polynomials and Rational Expressions MP 2 – Reason abstractly and quantitatively.	Rewrite rational expressions	A-APR.D.7 (+) - Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	7.1 7.2 - Define rational functions and describe their domains.	Find the domain of the rational function. $f(x) = \frac{3x + 1}{2x^2 + x - 6}$		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Reasoning with Equations and Inequalities MP 7 – Look for and make use of structure.	Understand solving equations as a process of reasoning and explain the reasoning	A-REI.A.2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	7.4 - Solve rational equations.	Solve the rational equation. $\frac{3}{x-2} + \frac{21}{x^2-4} = \frac{14}{x+2}$		
How can we best represent and	Coordinate geometry can be	Interpreting Functions	Interpret functions that	F-IF.B.5 - Relate the domain of a	7.4 - Determine	Without solving, state the		

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
verify geometric/algebraic relationships?	used to represent and verity geometric/algebraic relationships.	MP 2 – Reason abstractly and quantitatively.	arise in applications in terms of the context	function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*	the domain of the variable in a rational equation.	restrictions on the domain. $\frac{3}{x+4} - \frac{2}{x-9} = 0$		
Unit 7 - **Quadratic Equations and Inequalities** **Pacing: 14 days**						Common Unit Test		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	The Complex Number System MP 2 – Reason abstractly and quantitatively.	Use complex numbers in polynomial identities and equations.	N-CN.C.7 - Solve quadratic equations with real coefficients that have complex solutions.	9.1 9.2 - Solve quadratic equations by using the quadratic formula.	Use the quadratic formula to solve the equation. $2x^2 + 4x + 1 = 0$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Seeing Structure in Expressions MP 4 – Model with mathematics.	Interpret the structure of expressions	A-SSE.A.1 - Interpret expressions that represent a quantity in terms of its context.*	9.4 - Solve applied problems using quadratic functions as models.	An object is projected directly upward from the ground. After t seconds its distance in feet above the ground is $s(t) = 144t - 16t^2$. After how many seconds will the object be	WHST.9.10.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or	9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
						128 ft above the ground?	technical processes.	
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Seeing Structure in Expressions MP 7 – Look for and make use of structure.	Interpret the structure of expressions	A-SSE.A.1.b - Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.	9.3 9.4 - Solve an equation that is quadratic in form by substitution.	Solve the equation and check your solutions. $1 - \frac{1}{2x+1} - \frac{1}{(2x+1)^2} = 0$		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Creating Equations MP 2 – Reason abstractly and quantitatively.	Create equations that describe numbers or relationships	A-CED.A.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	9.2 - 9.5 - Solve quadratic and rational inequalities.	Solve each inequality and graph the solution set. a. $10x^2 + 9x \geq 9$ b. $\frac{x-1}{x-4} > 0$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations* MP 4 – Model with mathematics.	Create equations that describe numbers or relationships	A-CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions	9.1 9.3 9.4 - Solve applied problems using Pythagorean Theorem and area formulas.	The diagonal of a rectangular rug measures 26 ft, and the length is 4 ft more than twice the width. Find the length and width of the rug.		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.				
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Creating Equations* MP 1 – Make sense of problems and persevere in solving them.	Create equations that describe numbers or relationships	A-CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V=IR to highlight resistance R.	9.4 - Solve formulas for variables involving squares and square roots.	Solve the equation for the given variable. S = $2\pi rh + \pi r^2$ $for\ r$		
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 2 – Reason abstractly and quantitatively.	Understand solving equations as a process of reasoning and explain the reasoning	A-REI.A.2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	9.3 - Solve an equation with fractions by writing it in quadratic form.	Solve the equation and check your solutions. $1 - \frac{1}{2x+1} - \frac{1}{(2x+1)^2} = 0$		
What makes an algebraic algorithm both	Algebraic and numeric procedures are interconnected	Reasoning with Equations and Inequalities	Solve equations and inequalities in	A-REI.B.4 - Solve quadratic equations in one variable.	9.1 9.3 - Solve quadratic equations by	Use the square root property to solve the equation. $(x+2)^2 = 25$		

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
effective and efficient?	and build on one another to produce a coherent whole.	MP 2 – Reason abstractly and quantitatively.	one variable		using the square root property.			
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 2 – Reason abstractly and quantitatively.	Solve equations and inequalities in one variable	A-REI.B.4.a - Use the method of completing the square to transform any quadratic equations in x into an equation of the form (x - p)2 =q that has the same solution. Derive the quadratic formula from this form.	9.1 - Solve quadratic equations by completing the square.	Solve the equation by completing the square. $x^2 - 4x - 32 = 0$		
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Reasoning with Equations and Inequalities MP 1 – Make sense of problems and persevere in solving them.	Solve equations and inequalities in one variable	A-REI.B.4.b - Solve quadratic equations by inspection (e.g., for x2 = 49, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a	9.1 - 9.4 - Solve a quadratic equation by using the appropriate method.	Solve by any method. a. $3x^2 - 4x = -5$ b. $3 - \frac{16}{x} - \frac{12}{x^2} = 0$		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				± bi for real numbers a and b.				
Unit 8 - **Additional Graphs of Functions and Relations** **Pacing: 10 days**						Common Unit Test		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	One representation may sometimes be more helpful than another; used together, multiple representations give a fuller understanding of a problem	Seeing Structure in Expressions MP 7 – Look for and make use of structure.	Write expressions in equivalent forms to solve problems	A-SSE.B.3.b - Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	10.3 - Find the vertex of a vertical parabola.	Find the vertex of the graph by completing the square. $f(x) = x^2 - 4x + 5$		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Creating Equations* MP 5 – Use appropriate tools strategically.	Create equations that describe numbers or relationships	A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	10.2 10.3 10.5 - Graph quadratic functions in vertex form.	Identify the vertex of the parabola, and graph it. $f(x) = -(x - 5)^2+6$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations* MP 4 – Model with mathematics.	Create equations that describe numbers or relationships	A-CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-	10.2 10.3 10.5 - Use quadratic functions to solve problems involving maximum or minimum value.	If air resistance is neglected, a projectile on Earth shot straight upward with an initial velocity of 40 m per sec will be at height s in meters given by		9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.		$s(t) = -4.9t^2 + 40t$ where t is the number of seconds elapsed after projection. After how many seconds will it reach its maximum height, and what is this max height?		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Interpreting Functions MP 5 – Use appropriate tools strategically.	Interpret functions that arise in applications in terms of the context	F-IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts, intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums;	10.3 10.5 - Graph a quadratic function in standard form.	Graph the quadratic function defined by $y = -2x^2 + 4x - 5$		

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				symmetries; end behavior; and periodicity.*				
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Interpreting Functions MP 5 – Use appropriate tools strategically.	Analyze functions using different representations	F-IF.C.7.a - Graph linear and quadratic functions and show intercepts, maxima, and minima.	10.2 10.3 - Graph quadratic functions	Graph the parabola using any method. Label the vertex, max or min, and asymptote. $y = x^2 + 8x + 10$		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Interpreting Functions MP 5 – Use appropriate tools strategically.	Analyze functions using different representations	F-IF.C.7.b - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	10.5 - Graph absolute value and piecewise functions. **Add 8.1 Graph radical functions.	Sketch the graph of each function. a. y= 3|x-2| - 1 b. $f(x) = \begin{cases} 2x & \text{if } x \le -1 \\ x - 1 & \text{if } x > -1 \end{cases}$		9.4.12.O.(2).6 - Demonstrate the knowledge and technical skills needed to obtain and succeed in a chosen scientific and mathematical field.
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Interpreting Functions MP 4 – Model with mathematics. MP 8 – Look for and express regularity in repeated reasoning.	Analyze functions using different representations	F-IF.C.8.a - Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	10.3 - Find the vertex of a parabola by completing the square or factoring.	Morgan's Department Store wants to construct a rectangular parking lot on land bordered on one side by a highway. It has 280 ft of fencing that is to be used to fence off the other three sides. What should be the dimensions of the lot if the enclosed area is to be a maximum? What is the max area?		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.

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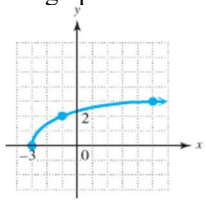
Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Building Functions MP 2 – Reason abstractly and quantitatively.	Build a function that models a relationship between two quantities	F-BF.A.1 - Write a function that describes a relationship between two quantities.*	10.1 10.2 - Review how functions are formed using operations on functions.	Let f(x) = $x^2 + 1$and g(x) =3x +5. find (f+g)(x), (f-g)(x), (fg)(x) and (f/g)(x).		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Building Functions MP 6 – Attend to precision.	Build a function that models a relationship between two quantities	F-BF.A.1. b - Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by a constant function to a decaying exponential, and relate these functions to the model.	10.1 - Find a difference quotient.	Find $\frac{f(x+h)-f(x)}{h}$ for $f(x) = 2x^2 - 1$		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations.	Building Functions MP 2 – Reason abstractly and quantitatively.	Build a function that models a relationship between two quantities	F-BF.A.1. c (+) - Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the	10.1 - Form composite functions and find their domains.	Find $f \circ g$ and $g \circ f$ if $f(x) = 5x + 3$ and $g(x) = -x^2 + 4x + 3$		

Essential Questions	Enduring Understandings	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
				location of the weather balloon as a function of time.				
Unit 9 - **Inverse, Exponential, and Logarithmic Functions** **Pacing: 13 days**						Common Unit Test		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Seeing Structure in Expressions MP 4 – Model with Mathematics. MP 7 – Look for and make use of structure.	Interpret the structure of expressions	A-SSE.A.1 - Interpret expressions that represent a quantity in terms of its context.*	11.6 - Solve applications involving base e exponential growth and decay.	Carbon 14 is a radioactive form of carbon that is found in all living plants and animals. After a plant or animal dies, the radioactive carbon 14 disintegrates according to the function defined by $y=y_0e^{-.000121t}$where t is time in years, y is the amount of sample at time t, and $y_0$is the initial amount present at t=0. If an initial sample contains y_0= 10 g or carbon14, how many grams will be present after 3000 yrs?		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Seeing Structure in Expressions MP 6 – Attend to precision.	Interpret the structure of expressions	A-SSE.A.1.b - Interpret complicated expressions by viewing one or more of their parts	11.6 - Solve applications of compound interest.	How much money will there be in an account at the end of 6 years if $2000 is deposited at 4%		9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find

				as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.		compounded quarterly?		solutions to real world problems.
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Seeing Structure in Expressions MP 1 – Make sense of problems and persevere in solving them. MP 8 – Look for and express regularity in repeated reasoning.	Write expressions in equivalent forms to solve problems	A-SSE.B.3.c - Use the properties of exponents to transform expressions for exponential functions. For example, the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.	11.2 11.6 - Solve exponential equations of the form $a^x = a^k$ for x.	Solve the equation. $16^{2x+1} = 64^{x+3}$		
What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Creating Equations* MP 2 – Reason abstractly and quantitatively. MP 7 – Look for and make use of structure.	Create equations that describe numbers or relationships	A-CED.A.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	11.6 - Solve equations involving logarithms.	Solve the equation. $\log_2(2x - 1) = 5$		
How can we best represent and verify geometric/algebr	How can we best represent and verify geometric/algebraic relationships?	Creating Equations*	Create equations that describe numbers or	A-CED.A.2 - Create equations in two or more variables to represent	11.1 11.2 11.3 - Find the equation of the inverse of a function.	Find the equation of the inverse for the function $f(x) = 2x - 1$.		

aic relationships?		MP 3 – Construct viable arguments and critique.	relationships	relationships between quantities; graph equations on coordinate axes with labels and scales.				
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Interpreting Functions MP 5 – Use appropriate tools strategically.	Analyze functions using different representations	F-IF.C.7.e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	11.2 11.3 - Graph exponential functions.	Graph the function $f(x) = 2^{2x+1}$		
How can we best represent and verify geometric/algebraic relationships?	How can we best represent and verify geometric/algebraic relationships?	Building Functions MP 2 -	Build new functions from existing functions	F-BF.B.4 - Find inverse functions.	11.1 - Decide whether a function is one-to-one and, if it is, find its inverse.	Decide whether the function is one-to-one and if so, find its inverse. {(3, 6), (2, 10), (5, 12)}		9.4.12.O.(2).6 - Demonstrate the knowledge and technical skills needed to obtain and succeed in a chosen scientific and mathematical field.
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Building Functions MP 2 – Reason abstractly and quantitatively.	Build new functions from existing functions	F-BF.B.4 c (+) - Read values of an inverse function from a graph or a table, given that the function has an inverse.	11.1 - Given the graph of a function, graph its inverse.	Find the inverse of the graph. 	SL.11-12.5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	

What makes an algebraic algorithm both effective and efficient?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Building Functions MP 1 – Make sense of problems and persevere in solving them.	Build new functions from existing functions	F-BF.B.5 (+) - Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	11.3 - 11.6 - Solve a logarithmic equation using the properties of logarithms and exponents.	Solve the equation. log4x - log(x-3)=log2		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Linear and Exponential Models* MP 4 – Model with mathematics.	Interpret expressions for functions in terms of the situation they model	F-LE.B.5 - Interpret the parameters in a linear or exponential function in terms of a context.	11.2 - Use exponential functions in applications involving growth or decay.	A small business estimates that the value V(t) of a copy machine is decreasing according to the function defined by $V(t) = 5000(2)^{-0.15t}$ where t is the number of years that have elapsed since the machine was purchased, and V(t) is in dollars. What was the original value of the machine? After 5 years?		
Unit 10 – Trigonometry **Pacing: 50 days**						Common Unit Test		
How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Trigonometric Functions MP 2 – Reason abstractly and quantitatively.	Extend the domain of trigonometric functions using the unit circle	F.TF.1 - Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	Calculate radian measure given an angle in degrees	Convert 120° into radians.		9.4.12.O.(1).3 - Demonstrate the ability to select, apply, and convert systems of measurement to solve problems.

How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Trigonometric Functions MP 2 – Reason abstractly and quantitatively.	Extend the domain of trigonometric functions using the unit circle	F.TF.2 - Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Use the unit circle in the coordinate plane to extend trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclock wise around the unit circle.	Find the exact values of the six trigonometric functions for $\frac{29\pi}{6}$		
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Trigonometric Functions MP 8 – Look for and express regularity in repeated reasoning.	Extend the domain of trigonometric functions using the unit circle	F.TF.3 (+) - Use special triangles to determine geometrically the values of sine, cosine, tangent for *p/3* , *p/4*, and *p/6*, and use the unit circle to express the values of sine, cosines, and tangent for *x, p+x,* and *2p-x* in terms of the values for *x*, where *x* is any real number.	Use the unit circle to find the six trigonometric functions for angle measures $0 \le \theta \le 2\pi$ or any correspondin g coterminal angles	Using the unit circle, find the exact values of the six trigonometric functions for: (a) $\frac{7\pi}{6}$ (b) - $\frac{10\pi}{3}$		
How do geometric relationships help to solve problems and/or	Geometric relationships provide a means to make sense of a variety of phenomena.	Trigonometric Functions MP 7 – Look for and make use of structure.	Extend the domain of trigonometric functions using the unit circle	G.STR.C7 - Explain and use the relationship between the sine and cosine of	15.1 - Use the co-functions identities.	Write each function in terms of its co-function. A. cos 52		

make sense of phenomena?				complementary angles.		B. tan 71 C. sec 24		
How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Similarity, Right Triangles, and Trigonometry MP 1- Make sense of problems and persevere in solving them.	Define trigonometric ratios and solve problems involving right triangles.	G.STR.8 - Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	Solve right triangles using a variety of methods	Solve the following right triangles: (a) a = 5 and c = 10 (b) $\beta = 72°$ and a = 15 (c) If the flagpole that a golfer aims toward on a green measures 5 feet from the ground to the top of the flag, and a golfer measures a 1° angle from top to bottom of the flagpole, how far is the golfer from the bottom of the flagpole?	RST.9-10.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.	9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Creating Equations* MP 5 – Use appropriate tools strategically.	Create equations that describe numbers or relationships	A-CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	17.1 - Graph f(x) = sin x and f(x) = cos x.	Graph each function over one period. a. y = 2cos x b. y = -sin 0.5 x		

How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Trigonometric Functions MP 8 – Look for and express regularity in repeated reasoning.	Prove and apply trigonometric identities	F-TF.C.8 - Prove the Pythagorean identity sin2(θ) +cos2(θ) = 1 and use it to calculate trigonometric ratios.	14.4 - Use the Pythagorean and quotient identities to find function values.	Find cosθ, given that sin θ= ⅗ and θ is in quadrant II.		
How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Congruence MP 2 – Reason abstractly and quantitatively. MP 3 – Construct viable arguments and critique.	Experiment with transformations in the plane	G-CO.A.1 - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	14.2 - Classify triangles and find the unknown angle measures and side lengths in similar triangles.	a. Classify the triangle.  b. A tree casts a shadow 45 m long. At the same time, the shadow cast by a vertical 2-m stick is 3 m long. Find the height of the tree.		9.4.12.O.(2).2 - Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.
Unit 11 – Oblique Triangles and Vectors **Pacing: 10 days**						Common Unit Test		
How do geometric relationships help to solve problems and/or make sense of phenomena?	Geometric relationships provide a means to make sense of a variety of phenomena.	Similarity, Right Triangles, and Trigonometry MP 7 – Look for and make use of structure.	Apply trigonometry to general triangles	G- STR.9 (+) - Derive the formula *A=1/2 ab* sin (C) for the area of a triangle by drawing an auxiliary line for the vertex perpendicular to the opposite side.	Given 2 sides of a triangle and the included angle, find the area using the formula *A=1/2 ab* sin (C)	Given ΔABC, if a = 25, b=18 and m $\angle$ C = 76°, find the area of ΔABC .		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.

How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Similarity, Right Triangles, and Trigonometry MP 1 – Make sense of problems and persevere in solving them.	Apply trigonometry to general triangles	G.STR.11 (+) - Understand and apply the Law of Sines and the Laws of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	Solve oblique triangles using the Law of Sines and Law of Cosines	Solve the given oblique triangles. (a) $\alpha = 45°$, $\gamma = 60°$ and $a = 10$ (b) $a = 8.1$, $b = 8.3$ and $\alpha = 72°$ (c) $a = 5$, $b = 8$ and $c = 7$	WHST.9-10.1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence. A. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.	
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	The Real Number System MP 4 – Model with mathematics.	Represent and model with vector quantities.	N.VM.2 (+) - Find the components of a vector by subtracting the coordinates of an initial point from	Represent a vector using appropriate vector notation	Find the vector that has a magnitude of 3 and a direction angle of 75°.	RST.9-10.4 - Determine the meaning of symbols, key terms, and other domain-	

				the coordinates of a terminal point.	Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	If A(-3,4) and B(5,-7), find the component form of $\overrightarrow{AB}$	specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.	
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	The Real Number System MP 1 – Make sense of problems and persevere in solving them.	Represent and model with vector quantities.	N.VM.4a - Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.	Perform vector addition using the most appropriate method for the given situation	Given the vectors <-2, 5> and <4, -9>, find the resultant vector.		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	The Real Number System MP 6 – Attend to precision.	Represent and model with vector quantities.	N.VM.4b - Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.	Determine the magnitude and direction of the sum of two vectors	If $\vec{A}$ has a magnitude of 6 and a direction angle of 25° and $\vec{B}$ has a magnitude of 4 and a direction angle of 160° find the resultant vector and it's magnitude.	RST.9-10.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.	9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	The Real Number System MP 7 – Look for and make use of structure.	Represent and model with vector quantities.	N.VM.5a - Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$.	Represent scalar multiplication algebraically	Given the vector <-2,3> find m<-2,3> algebraically. (a) m = 2 (b) m = - ½		
Final Exam **Pacing: 1 day**								