Hillsborough Township Public Schools
Mathematics Department
Math Analysis Curriculum Map

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
Unit: Prerequisites **Pacing: CP – 6 days** **H – 10 Days**						Common Unit Assessment		
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.	See Structure in Expressions SMP 2 - Reason abstractly and quantitatively	Simplify expressions, including exponential, radical, rational, polynomial	A-SSE.1,2,3 - Write expressions in equivalent forms to solve problems	Use laws of exponents to simplify expressions, simplify radical expressions, simplify rational expressions, simplify and factor various polynomials.	Know and apply laws of exponents to products, quotients, powers. Simplify radicals including square roots and other nth roots. Add, subtract, multiply and divide rational expressions.	RST.9-10.3. - Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	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.	Algebraic representation can be used to generalize patterns and relationships.	Reasoning with equations and inequalities SMP 1 - Make sense of problems and persevere in solving them.	Represent and solve equations and inequalities	A-REI.11 - Combine polynomial, radical, rational and exponential functions.	Use previously learned methods to solve linear, quadratic, radical, rational, and absolute value equations. Express solutions in interval notation (new).	Solve equations of each type. Check solutions by substitution.		9.4.12.O.(1).2 - Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
Unit: Graphing **Pacing: CP – 19 days** **H – 16 Days**						Common Unit Assessment		
How can patterns, relations, and functions be	Algebraic representation can be used to generalize	Creating Equations*	Create equations that describe	A-CED.2 - Create equations in two or more variables to represent	Calculate slope. Write linear equations in point-slope, slope-	(a) Given 2 points, calculate slope: (b) Using the slope and a point, write	RST.9-10.3. - Follow precisely a complex multi-	9.4.12.O.(1).2 - Apply and use algebraic, geometric, and

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used as tools to best describe and help explain real-life situations.	patterns and relationships.	SMP 4 - Model with mathematics.	numbers or relationships	relationships between quantities; graph equations on coordinate axes with labels and scales.	intercept and general forms.	an equation of a line in point-slope form. (c) Given slope and a point on a line, write the equation of the line in slope-intercept form. (d) Take another form and rewrite into standard form.	step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	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.	Algebraic representation can be used to generalize patterns and relationships	Creating Equations SMP 2 - Reason abstractly and quantitatively.	Create equations that describe numbers or relationships	A-CED.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Graph lines using tables and intercepts. Compute parallel and perpendicular slopes.	Given the linear equation, $f(x)=5x-4$ Graph both intercepts in order to graph the line. Write the equations of the lines that are parallel and perpendicular to the given line.		
What situations can be analyzed using transformations and symmetries?	Shape and area can be conserved during mathematical transformations.	Congruence SMP 7 - Look for and make use of structure.	Experiment with transformations in the plane	G-CO.2 - Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs Compare transformations that preserve distance and angle to those	Graph transformations of functions using symmetry, reflections, translations and dilations.	Begin by graphing the square root function, f(x) = $\sqrt{x}$ Then use transformations of this graph to graph the given functions (a) f(x) = $\sqrt{x}+3$ (b) f(x) = $2\sqrt{x-2}$ (c) f(x) = $-\sqrt{x}-2$ (d) f(x) = $\sqrt{-x+1}$		

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				that do not (e.g., translation versus horizontal stretch).				
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.	Building Functions SMP 4 - Model with mathematics.	Build a function that models a relationship between two quantities	F.BF.1 - Write a function that describes a relationship between two quantities.	Construct functions from verbal descriptions	A new running track is to be constructed in the shape of a rectangle with semicircles at each end. The track is to be 440 yards long. Express the area of the enclosed region of the track,A, as a function of its radius,r.		
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.	Building Functions SMP 4 - Model with mathematics.	Build a function that models a relationship between two quantities	F.BF.1c (+) - 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 location of the weather balloon as a function of time.*	Find domain. Combine and compose functions	Given 2 functions $f(x) = x^2 + 1$ (a) $g(x) = \frac{3}{x+1}$ State the domain of each function Find: (b) $(f \circ g)(x)$ (c) $(g \circ f)(x)$ (d) $(f \circ g)(4)$		
How can patterns, relations, and functions be used as tools to best describe and	Algebraic representation can be used to generalize patterns and relationships	Building Functions SMP 2 - Reason abstractly and quantitatively.	Build a function that models a relationship between two quantities	F.BF.4b (+) - Find inverse functions. Recognize situations in which one quantity changes at a constant rate per	Create inverse functions	Given a function f(x) = 2x – 3 create its inverse.		.

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help explain real-life situations.				unit interval relative to another.				
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	Building Functions SMP 6 - Attend to precision.	Build a function that models a relationship between two quantities	F.BF.4c (+) - Read values of an inverse function from a graph or a table, given that the function has an inverse.	Verify inverse functions	Given a function $f(x)=\frac{7}{x}-3$ (a) Find an equation for $f^{-1}(x)$ (b) Verify that your equation is correct by showing that $f(f^{-1}(x))=$ $f^{-1}(f(x))=x$		
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	Building Functions SMP 2 - Reason abstractly and quantitatively.	Build a function that models a relationship between two quantities	F.BF.4d (+) - Produce an invertible function from a non-invertible function by restricting the domain.	Restrict the domain to create an inverse of a function that is also a function.	Find the inverse of $f(x)=x^2+1$ *if* $x \geq 0$ Graph f and f^{-1} In the same rectangular coordinate system.		
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 and quantitatively.	Understand the concept of a function and use function notation	F-IF.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of context.	State domain and range of a given function. Evaluate a function using its graph.	Given the function $f(x)=\frac{2}{3}x-3$ (a) State its domain and range (b) Graph the function (c) Using the graph, evaluate f(-6)		
Unit: Polynomial and Rational Functions **Pacing: CP – 20 days** **H – 20 days**						Common Unit Assessment		

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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 SMP 6 - Attend to precision.	Perform arithmetic operations with complex numbers.	N-CN.2 - Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	Simplify complex expressions.	Expand the expression $(6-7i)(2+5i)$		
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.	The Complex Number System SMP 7 - Look for and make use of structure.	Use complex numbers in polynomial identities and equations.	N-CN.9 (+) - Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	Find zeros of quadratic functions.	Find the zeros of $f(x) = 4x^2-12x+9$ Find the zeros of $f(x) = (x+3)^2 + 1$		
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.	Arithmetic with Polynomials and Rational Expressions SMP 6 - Attend to precision.	Understand the relationship between zeros and factors of polynomials	A-APR.2 - Know and apply the Remainder and Factor Theorems: For a polynomial $p(x)$ and number c, the remainder on division by $x - c$ is $p(c)$, so $p(c) = 0$ if and only if $(x - c)$ is a factor of $p(x)$.	Use polynomial division to find the zeros of polynomial functions.	Find the zeros of $f(x) = x^3+3x^2-4$		
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.	Arithmetic with Polynomials and Rational Expressions	Rewrite rational expressions	A-APR.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	Use polynomial division to simplify rational expressions.	Divide $(5x^3+6x+8)/(x+2)$		

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		SMP 6 - Attend to precision.		$r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or synthetic division.				
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.	Arithmetic with Polynomials and Rational Expressions SMP 1 - Make sense of problems and persevere in solving them.	Solve polynomial equations	A-APR.4 Prove polynomial identities and use them to describe numerical relationships. For example, the difference of two squares; the sum and difference of two cubes, the polynomial identity $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.	Use the rational root theorem and other techniques to solve higher degree polynomial equations.	Solve the equation $x^4 - 6x^2 - 8x+24=0$		
How can we use mathematical models to describe physical relationships?	Mathematical models can be used to describe and quantify physical relationships.	Creating Equations* SMP 4 - Model with mathematics.	Create equations that describe numbers or relationships	A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions.	Construct then solve one-variable equations and inequalities from verbal models.	You have 600 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. What is the largest area that can be enclosed?		
How are patterns of	Patterns and relationships	Interpreting Functions	Analyze functions	F-IF.7a - Graph linear and quadratic	Graph quadratic functions using	Use the vertex and intercepts to sketch		

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change related to the behavior of functions?	can be represented graphically, numerically, symbolically, or verbally.	SMP 4 - Model with mathematics.	using different representations	functions and show intercepts, maxima, and minima.	vertex and intercepts. Additionally, graph higher degree polynomial functions, using end behavior and intercepts.	the graph of quadratic functions: $f(x) = (x+1)^2–4$ $f(x) = 2x^2–7x–4$		
How are patterns of change related to the behavior of functions?	Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.	Interpreting Functions SMP 6 - Attend to precision.	Analyze functions using different representations	F-IF.7d (+) - Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.	Find zeros of rational functions. Find vertical, horizontal and slant asymptotes of rational functions. Graph rational functions.	Use zero(s) and asymptote(s) to graph $f(x) = 2x/(x–1)$		
Unit: Exponential and Logarithmic Functions **Pacing: CP – 11 days** **H – 13 days**						Common Unit Assessment		
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 SMP 2 - Reason abstractly and quantitatively	Build new functions from existing functions	F.BF.5(+) – Use the inverse relationship between exponents and logarithms to solve problems involving exponents and logarithms.	Evaluate exponential and logarithmic functions.	Rewrite each function in exponential or logarithmic form: (a) $\log_5 125 = 3$ Evaluate: (b) $\log_{54} 64$ (c) $\log_{3} \frac{1}{\sqrt{3}}$		
How can we use physical models to clarify mathematical relationships?	Physical models can be used to clarify mathematical relationships.	Building Functions SMP 2 - Reason	Build new functions from existing functions	F.BF.5(+) – Use the inverse relationship between exponents and logarithms to solve problems	Graph logarithmic functions using transformations.	Given $f(x) = \log_2 x$ graph (a) $f(x) = \log_2(x-2)$		

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		abstractly and quantitatively.		involving exponents and logarithms.		(b) f(x) = $\log_2(-x)$ (c) f(x) = –3 + $\log_2 x$		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Building Functions SMP 2 - Reason abstractly and quantitatively.	Build new functions from existing functions	F.BF.5(+) – Use the inverse relationship between exponents and logarithms to solve problems involving exponents and logarithms.	Learn the properties of logarithms and methods for solving logarithmic and exponential equations.	Expand or condense using the properties of logarithms: (a) $\log_2\left(\frac{xy^2}{64}\right)$ (b) $\frac{1}{2}\ln(x) - \ln(y)$ Solve: (c) $3^{x+4} = 7^{2x-1}$ (d) $\ln(x+4) - \ln(x+1) = \ln(x)$		
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 SMP 2 - Reason abstractly and quantitatively.	Analyze functions using different representations	F-IF.7e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	Solve and graph exponential functions.	Solve: (a) $125^x = 25$ (b) $9^{x+2} = 27^{-x}$ Given $f(x) = 3^x$ (c) graph $f(x) = 3^{x+2}$ and $f(x) = 3^x + 2$		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations.	How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations.	Interpreting Functions SMP 4 - Model with mathematics.	Analyze functions using different representations	F-IF.7e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	Learn applications of exponential and logarithmic functions including exponential growth and decay.	(a) What interest rate, to the nearest tenth percent, is required for an investment subject to continuous compounding to triple in 5 years?		

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						(b) Use Newton's Law of Cooling to solve this exercise: You are served a cup of coffee that is 185°F. The room temperature is 65°F. After 2 minutes, the coffee has cooled to 155°F 1) Write a model for the temperature of the coffee, T, after t minutes. 2) When will the coffee be 105°F?		
Mid-term **Pacing: 1 Day**								
Unit: Trigonometric Functions **Pacing: CP – 28 days** **H – 27 days**						Common Unit Assessment		
How can trigonometric ratios be used to model and solve real-world problems?	The equation for circumference of a circle is derived by using the relationship between arc length and radius of a circle.	Trigonometric Functions SMP 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.	Convert between degrees and radians.	Convert $10\pi/9$ to degrees. Convert 200^{o} to radians.	RST.11-12.4. - 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 11–12 texts and topics*.	
How can trigonometric	Circular motion can be	Number and Quantity	Quantities	N-Q.1 - Use units as a way to understand	Use linear and angular speed to	Find the linear and angular speed of an		9.1.12.A.1 - Apply critical thinking and

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ratios be used to model and solve real-world problems?	described using different notions of movement.	SMP 4 - Model with mathematics.		problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas	describe motion on a circular path	8 ft. fan blade rotating at 2 revolutions per second.		problem-solving strategies during structured learning experiences.
How can we best represent and verify geometric/algebraic relationships?	Coordinate geometry can be used to represent and verity geometric/algebraic relationships.	Trigonometric Functions SMP 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.	Express points around the unit circle, when centered at the origin of the coordinate plane, as ordered pairs. Correlate triangle trigonometric relationships to ordered pair trigonometric relationships. Evaluate trigonometric functions using ordered pairs.	On a unit circle centered at the origin of a coordinate plane, label the twelve special angle points and the four quadrantal angle points using ordered pairs. Let P=(–12,5) be a point on the terminal side of Θ. Find each of the six trigonometric functions of Θ.		
What situations can be analyzed using transformations and symmetries?	Shape and area can be conserved during mathematical transformations.	Trigonometric Functions SMP 5 - Use appropriate tools strategically.	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 $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi–x$, $\pi+x$, and $2\pi–x$ in terms of their values for x, where x is any real number.	Define reference angles. Evaluate trigonometric functions of any angle whose reference angle is $\pi/3$, $\pi/4$ or $\pi/6$ by using properties of reflection in the coordinate plane.	Find the value of the six trigonometric functions of $7\pi/4$.		

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What situations can be analyzed using transformations and symmetries?	Shape and area can be conserved during mathematical transformations.	Trigonometric Functions SMP 5 - Use appropriate tools strategically.	Extend the domain of trigonometric functions using the unit circle	F-TF.4 (+) - Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	Define co-terminal angles. Evaluate trig functions of any value by using symmetric properties.	Find the value of the six trigonometric functions of $13\pi/3$.		
How are patterns of change related to the behavior of functions?	Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.	Trigonometric Functions SMP 4 - Model with mathematics.	Model periodic phenomena with trigonometric functions	F-TF.5 - Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★	Graph trigonometric equations in two variables, including their transformations. Translate verbal models of periodic phenomena into two-variable trigonometric equations.	Graph $y= -3\sin(2x)+1$ A clock with an hour hand that is 15" long is hanging on a wall. At noon, the distance between the tip of the hour hand and the ceiling is 23". At 3 p.m., the distance is 38"; at 6 p.m., 53"; at 9 p.m., 38"; and at midnight the distance is again 23". If *y* represents the distance between the tip of the hour hand and the ceiling *x* hours after noon, write an equation that models the hour hand's distance from the ceiling.	RST.11-12.4. - 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 11–12 texts and topics*.	9.3.12.ED.2 - Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.
How can trigonometric relationships be used to model and	Problems can be visualized mathematically and modeled to	Similarity, Right Triangles, and Trigonometry	Define trigonometric ratios and solve problems	G-SRT.8 - Use trigonometric ratios and the Pythagorean Theorem to solve	Solve problems involving measurement and bearings	A boat leaves the entrance to a harbor and travels 25 miles on a bearing of N42E,		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during

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solve real-world problems?	apply those skills in solving	SMP 4 - Model with mathematics.	involving right triangles	right triangles in applied problems.		then turns 90 degrees clockwise and travels 18 mi S48E. At that time, how far is the boat from the harbor and at what bearing?		structured learning experiences.
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.	Trigonometric Functions SMP 4 - Model with mathematics.	Model periodic phenomena with trigonometric functions	F-TF.6 (+) - Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.	Evaluate the inverse functions of domain-restricted trigonometric functions.	Find the exact value of $\sin^{-1}(1/2)$		
How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations.	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Trigonometric Functions SMP 4 - Model with mathematics.	Model periodic phenomena with trigonometric functions	F-TF.7 (+) - Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★	Solve one-variable trigonometric equations. Interpret the solutions to two-variable trigonometric equations that model periodic phenomena.	Find all solutions of $5\sin\Theta + 1 = 3\sin\Theta$ If the number of hours of daylight in Boston is given by $y=3\sin[2\pi/365(x-79)]+12$ where x is the number of days after January 1, how many days after January 1 does Boston have 10.5 hours of daylight?	RST.11-12.4. - 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 11–12 texts and topics*.	
Unit: Analytic Trigonometry **Pacing: CP – 28 days** **H – 30 days**						Common Unit Assessment		
What makes a computational strategy both	Computational fluency includes	Trigonometric Functions	Prove and apply	F-TF.8 - Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$	Use the fundamental trigonometric	Verify: (a) $\sin x \sec x = \tan x$		9.1.12.A.1 - Apply critical thinking and problem-solving

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effective and efficient?	understanding the meaning and the appropriate use of numerical operations	SMP 8 - Look for and express regularity in repeated reasoning.	trigonometric identities	and use it to calculate trigonometric ratios.	identities to simplify expressions and prove trigonometric identities.	$\csc^2 x \sec x$ (b) $= \sec x +$ $\csc x \cot x$ (c) $\frac{\sin x}{1-\cot x} - \frac{\cos x}{\tan x - 1} = \sin x + \cos x$		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	Trigonometric Functions SMP 8 - Look for and express regularity in repeated reasoning.	Prove and apply trigonometric identities	F-TF.9 (+) - Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	Apply the sum and difference formulas for cosines, sines and tangents.	Find the exact value: (a) $\cos\left(\frac{3\pi}{4} - \frac{\pi}{6}\right)$ (b) $\sin 105°$ (c) $\tan 15°$		
What makes a computational strategy both effective and efficient?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Trigonometric Functions SMP 8 - Look for and express regularity in repeated reasoning.	Prove and apply trigonometric identities	F-TF.9 (+) - Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. MP 8 - Look for and express regularity in repeated reasoning.	Apply the double-angle formulas for cosines, sines and tangents.	Find the exact value of each given $\sin\vartheta = -\frac{9}{41} an$ (a) $\sin 2\vartheta$ (b) $\cos 2\vartheta$ (c) $\tan 2\vartheta$		
How do operations affect numbers?	Measurements can be used to describe, compare, and make sense of phenomena	Trigonometric Functions SMP 3 – Construct viable arguments and critique the	Prove and apply trigonometric identities	F-TF.9 (+) - Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	Solve trigonometric equations.	Find all solutions (a) $\sin 4x = \frac{\sqrt{3}}{2}$		

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		reasoning of others.				Find solutions over the interval $[0,2\pi)$ (b) $\tan\frac{x}{2}=\sqrt{3}$ (c) $2\sin^2 x=\sin x$ (d) $2\cos^2 x+\sin x$		
How can measurements be used to solve problems? (Honors only)	Measurements can be used to describe, compare, and make sense of phenomena.	Trigonometric Functions SMP 3 – Construct viable arguments and critique the reasoning of others.	Prove and apply trigonometric identities	F-TF.9 (+) - Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	Write a parametric equation. (Honors only)	Find a set of parametric equations for the parabola whose equation is $2\sin^2 x=\sin x+3$ $y=x^2-25$		
How can measurements be used to solve problems? (Honors only)	Measurements can be used to describe, compare, and make sense of phenomena	Trigonometric Functions SMP 3 – Construct viable arguments and critique the reasoning of others.	Prove and apply trigonometric identities	F-TF.9 (+) - Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	Graph polar equations. (Honors only)	Graph the equation $r=4\sin\vartheta$ with ϑ in radians. Use multiples of $\frac{\pi}{6}$ over $[0,\pi]$ to generate coordinates for points (r,ϑ).		
How do mathematical ideas interconnect and build on	Numeric fluency includes both the understanding	Building Functions SMP 7 – Look for and make	Build new functions from existing functions	F-BF.4d (+) - Produce an invertible function from a non-invertible function	Rewrite rectangular equations as polar equations or	Rewrite x^2 + y^2 = 4 in polar.	RST.11-12.4. - Determine the meaning of symbols, key terms, and other	9.1.12.A.1 - Apply critical thinking and problem-solving strategies during

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one another to produce a coherent whole?	of and the ability to appropriately use numbers	use of structure.		by restricting the domain.	parametric equations. (Honors only)		domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.	structured learning experiences.
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	Numeric fluency includes both the understanding of and the ability to appropriately use numbers	The Complex Number System SMP 7 – Look for and make use of structure.	Represent complex numbers and their operations on the complex plane.	N.CN.4 (+) - Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.	Graph in polar coordinates. (Honors only)	Rewrite the point (2,2) in polar coordinates. Graph 3+4i on the complex plane.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
How can measurements be used to solve problems?	Everyday objects have a variety of attributes, each of which can be measured in many ways	Similarity, Right Triangles, and Trigonometry SMP 7 – Look for and make use of structure.	Apply trigonometry to general triangles	G-SRT.10 (+) - Prove the Laws of Sines and Cosines and use them to solve problems.	Apply the law of sines to find unknown parts of a triangle.	Given information about ΔABC, solve the triangle. (a) A=44°, B=25°, a=12 (b) B=80°, C=10°, a=8 (c) A=20°, a=30, b=40		
How can measurements be used to solve problem?	Everyday objects have a variety of attributes, each of which can be measured in many ways	Similarity, Right Triangles, and Trigonometry	Apply trigonometry to general triangles	G-SRT.9 (+) - Derive the formula *A=1/2 ab* sin (C) for the area of a triangle by drawing an auxiliary line for the	Find the area of an oblique triangle.	Find the area of a triangle given its side measures, a=16m, b=10m, c=8m		

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
		SMP 6 – Attend to precision.		vertex perpendicular to the opposite side.				
How can measurements be used to solve problems?	Everyday objects have a variety of attributes, each of which can be measured in many ways	Similarity, Right Triangles, and Trigonometry SMP 6 – Attend to precision.	Apply trigonometry to general triangles	G-SRT.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.	Find the area of a triangle given the lengths of two sides and the measure of the included angle	Given: A=22°, b=20', c=50' Calculate the area of the triangle.		
How can measurements be used to solve problems?	Everyday objects have a variety of attributes, each of which can be measured in many ways	Similarity, Right Triangles, and Trigonometry SMP 4 – Model with mathematics.	Apply trigonometry to general triangles	G-SRT.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).	Apply the law of cosines to find unknown parts of a triangle.	(a) Solve the triangle knowing only its side measures: a=10, b=12, c=16 (b) Solve the triangle given 2 sides and their included angle: a=6, c=5, B=50°		
Unit: Vectors and Complex Numbers **Pacing: CP – 5 days** **H – 5 days**						Common Unit Assessment		
In what different ways can we represent quantities?	Complex numbers can be represented algebraically and visually	The Complex Number System SMP 6 – Attend to precision.	Represent complex numbers and their operations on the complex plane.	N.CN.4 - Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.	Plot complex numbers in the complex plane and find the absolute value of a complex number	Determine the absolute value of z = 3 + 4i		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
In what different ways can we represent quantities?	Complex numbers can be represented algebraically and visually in different forms	The Complex Number System SMP 8 – Look for and express regularity in repeated reasoning.	Represent complex numbers and their operations on the complex plane.	N-CN.5 - Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.	Write complex numbers in polar form, finding the modulus and argument	$(-1 + \sqrt{3}\, i)^3 = 8$ because $(-1 + \sqrt{3}\, i)$ has modulus 2 and argument 120°.	RST.11-12.4. - 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 11–12 texts and topics*.	
In what different ways can we represent quantities?	Complex numbers can be represented algebraically and visually in different forms	The Complex Number System SMP 6 – Attend to precision.	Represent complex numbers and their operations on the complex plane.	N-CN.6 - Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.	Find the midpoint of a line segment in the complex plane.	What is the midpoint of the line segment between 2+i and 5 −3i?		
In what different ways can we represent and visualize quantities?	Vectors can be used to represent quantities of magnitude and direction	Vector and Matrix Quantities SMP 3 – Construct viable arguments and critique the reasoning of others.	Represent and model with vector quantities	N-VM.1 - Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, $\|v\|$, $\|\|v\|\|$, $\mathbf{v}$).	Use magnitude and direction to show vectors are equal.	Using a figure of two vectors in the x-y plane, show they are equal.	RST.11-12.4. - 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	

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
In what different ways can we represent and visualize quantities?	Vectors can be used to represent quantities of magnitude and direction	Vector and Matrix Quantities SMP 2 - Reason abstractly and quantitatively.	Represent and model with vector quantities	N-VM.2 - Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	Represent vectors in the rectangular coordinate system	Sketch the vector V = 3i – 3j and find its magnitude.	*grades 11–12 texts and topics*.	
How can vectors be used to model and solve real-world problems?	Vector components share similar properties to the real number system.	Vector and Matrix Quantities SMP 4 - Model with mathematics.	Represent and model with vector quantities	N-VM.3 - Solve problems involving velocity and other quantities that can be represented by vectors.	Solve applied problems involving vectors	The jet stream is blowing at 60 miles per hour in the direction N45E. Express its velocity as a vector.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
In what different ways can we represent and visualize quantities?	Vectors can be used to represent quantities of magnitude and direction.	Vector and Matrix Quantities SMP 2 - Reason abstractly and quantitatively.	Represent and model with vector quantities	N-VM.4 - Add and subtract vectors.	Perform operations with vectors in terms of i and j.	If v = 7i + 3j and w = 4i – 5j, find v + w		
				N-VM.5 - Multiply a vector by a scalar.	Perform operations with vectors in terms of i and j.	If v = 5i + 4j, find 6v.		
Unit: Matrices **Pacing: CP – 10 days** **H – 10 days**						Common Unit Assessment		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Vector and Matrix Quantities SMP 4 – Model with mathematics.	Perform operations on matrices and use matrices in applications.	N-VM.6 (+) - Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships to a network.	Write the augmented matrix for a linear system.	Write the augmented matrix for a linear system. $x - 2y + z = 10$ $3x + y = 5$ $7x - y + 2z = 2$	RST.11-12.4. - 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	9.1.12.B.2 - Create and respond to a feedback loop when problem solving.

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
							relevant to *grades 11–12 texts and topics*.	
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Vector and Matrix Quantities SMP 4 – Model with mathematics.	Perform operations on matrices and use matrices in applications.	N-VM.7 (+) - Multiply matrices by scalars to produce new matrices, e.g., as when all the payoffs in a game are doubled.	Multiply matrices.	If possible, given the following matrices, find their products. $A=\begin{bmatrix}4 & 0\\ -3 & 5\\ 0 & 1\end{bmatrix}$ $B=\begin{bmatrix}5 & 1\\ -2 & 2\end{bmatrix}$ $C=\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$ (a) AB (b) BA (c) AC (d) CB (e) BC		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Vector and Matrix Quantities SMP 6 – Attend to precision.	Perform operations on matrices and use matrices in applications.	N-VM.8 (+) - Add, subtract, and multiply matrices of appropriate dimensions.	Add and subtract matrices of appropriate dimensions	$A=\begin{bmatrix}2 & 8\\ 7 & -1\\ -5 & 2\end{bmatrix}$ $B=\begin{bmatrix}-9 & 7\\ 6 & 3\end{bmatrix}$ $C=\begin{bmatrix}3 & 4\\ 11 & 8\end{bmatrix}$ (a) AB+C (b) 2C-4B (c) ABC+CB		

Hillsborough Township Public Schools
Mathematics Department
Math Analysis Curriculum Map

Essential Question	Enduring Understanding	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	Vector and Matrix Quantities SMP 3 – Construct viable arguments and critique the reasoning of others.	Perform operations on matrices and use matrices in applications.	N-VM.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.	Verify that matrix multiplication is not commutative.	Verify that matrix multiplication is not commutative, given 2 matrices: $B = \begin{bmatrix} 5 & 1 \\ -2 & 2 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 4 \\ 11 & 8 \end{bmatrix}$ (a) BC (b) CB		
How do operations affect numbers?	Computational fluency includes understanding the meaning and the appropriate use of numerical operations	Vector and Matrix Quantities SMP 3 – Construct viable arguments and critique the reasoning of others.	Perform operations on matrices and use matrices in applications.	N-VM.10 (+) - Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	Use inverses to solve matrix equations.	Given a matrix equation, use the coefficient matrix' inverse to solve: $\begin{bmatrix} 2 & -6 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 14 \end{bmatrix}$		
How can complex problems be represented and solved mathematicall y?	Multivariable, multi-equation problems can be represented and solved with matrices	Reasoning with Equations and Inequalities SMP 4 - Model with mathematics.	Represent and solve equations and inequalities graphically	A-REI.8 - Represent a system of linear equations as a single matrix equation in a vector variable.	Write the augmented matrix for a linear system	Use a table for the nutritional content of 3 foods to write a system of linear equations that can be solved for nutritional guidelines	8.1.12.A - The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	9.3.12.BM.1 - Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
How can complex problems be represented and solved mathematicall y?	Multivariable, multi-equation problems can be represented and solved with matrices	Reasoning with Equations and Inequalities MP 4 - Model with mathematics. MP 5 - Use appropriate tools strategically.	Represent and solve equations and inequalities graphically	A-REI.9 - Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).	Solve systems of linear equations using inverses.	Use a table for the nutritional content of 3 foods to show under which conditions certain dietary guidelines are met.	8.1.12.A - The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	9.3.12.BM.1 - Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.
Unit: Conic Sections **Pacing: CP – 11 days** **H – 10 days**						Common Unit Assessment		
How can we best represent and verify geometric/ algebraic relationships?	Algebraic representation can be used to generalize patterns and relationships.	Expressing Geometric Properties with Equations (G.GPE) SMP 3 – Construct viable arguments and critique the reasoning of others.	Translate between the geometric description and the equation for a conic section.	G.GPE.3 (+) - Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.	Graph ellipses and hyperbolas centered at the origin and off the origin. Write equations of ellipses and hyperbolas in standard form. Solve applied problems involving ellipses and hyperbolas.	Find the standard form of the equation of an ellipse with foci at (-1,0) and (1,0) and vertices (-2,0) and (2,0).		
How can we best represent and verify geometric/ algebraic relationships?	Algebraic representation can be used to generalize patterns and relationships.	Expressing Geometric Properties with Equations (G.GPE) SMP 3 – Construct viable arguments and	Translate between the geometric description and the equation for a conic section.	G.GPE.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	Graph circles centered at the origin and off the origin. Write equations of circles in standard form. Translate between standard and general form.	Write in standard form and graph: $x^2+y^2+4x-6y-23=0$		

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
		critique the reasoning of others.		of a circle given by an equation.	Solve applied problems involving circles.			
How can we best represent and verify geometric/ algebraic relationships?	Algebraic representation can be used to generalize patterns and relationships.	Expressing Geometric Properties with Equations (G.GPE) SMP 3 – Construct viable arguments and critique the reasoning of others.	Translate between the geometric description and the equation for a conic section.	G.GPE.2 - Derive the equation of a parabola given a focus and directrix.	Graph parabolas with vertices centered at the origin and off the origin. Write equations of parabolas in standard form. Solve applied problems involving parabolas.	Find the standard form of the equation of a parabola with focus (5,0) and directrix x = -5.		
Unit: Sequences **Pacing: CP – 8 days** **H – 11 days**						Common Unit Assessment		
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.	Seeing Structure in Expressions SMP 4 – Model with mathematics.	Write expressions in equivalent forms to solve problems	A-SSE.4 - Derive and or explain the derivation of the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* ★	Identify the first term, common ratio, and number of terms of a finite geometric series. Identify the first term, common ratio, and number of terms of a verbal model of a finite geometric series. Apply the formula for finding the sum of a finite geometric series.	Suppose you save $1 the first day of a month, $2 the second day, $4 the third day, continuing to double your savings each day. What will your total savings be for the first 30 days?		
What makes an algebraic algorithm both	Algebraic and numeric procedures are interconnected	Interpreting Functions	Understand the concept of a function and	F-IF.3 - Recognize that sequences are functions, sometimes defined	Compute values of a sequence using its recursive formula.	Write the first four terms of the sequence defined		

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effective and efficient?	and build on one another to produce a coherent whole.	SMP 8 – Look for and express regularity in repeated reasoning.	use function notation	recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥1.*	Compute values of a sequence using its explicit formula.	by $a_1=7$ and $a_n=a_{n-1}+5$ for $n\geq 2$ Write the first four terms of the sequence defined by $a_n=(-1)^n(n+3)$		
How can change be best represented mathematicall y?	The symbolic language of algebra is used to communicate and generalize the patterns in mathematics	Building Functions SMP 4 – Model with mathematics.	Build a function that models a relationship between two quantities	F-BF.2 - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★	Identify whether a sequence is arithmetic, geometric, or neither. Write arithmetic and geometric sequences recursively. Write the explicit formula for an arithmetic sequence. Write an explicit formula for a geometric sequence. Translate between a recursive formula and an explicit formula.	Write both a recursive and an explicit formula for the sequence 1, 5, 9, 13, … Write both a recursive and an explicit formula for the sequence 3, 12, 48, 192, … Write an explicit formula for the sequence $a_n=a_{n-1}+3$, $a_1=4$ Write a recursive formula for the sequence $a_n=4(2)^{n-1}$		
Unit: Limits **Pacing: CP – 9 days** **H – 8 days**						Common Unit Assessment		
How do mathematical ideas interconnect	Numeric fluency includes both the	Mathematical Practices	The Standards for Mathematical Practice	SMP.2 - Reason abstractly and quantitatively.	Interpret limit notation and determine if a limit exists.	Construct a table to find the indicated limit:	RST.11-12.4. - Determine the meaning of symbols, key	9.1.12.A.1 - Apply critical thinking and problem-solving strategies during

Essential Question	Enduring Understanding	Domain	Cluster	Standard	Learning Targets	Assessment Formative and Summative	Inter-disciplinary Connections	21st Century Connections
and build on one another to produce a coherent whole?	understanding of and the ability to appropriately use numbers		describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.				terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.	structured learning experiences.
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	Numeric fluency includes both the understanding of and the ability to appropriately use numbers	Mathematical Practices	The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.	SMP.5 - Use appropriate tools strategically.	Find limit the limit of a function using tables and graphs.	(a) Given a graph of a function, use the graph to find indicated limits and function values, or state that the limit or function value does not exist.		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	Numeric fluency includes both the understanding of and the ability to appropriately use numbers	Interpreting Functions SMP 3 – Construct viable arguments and critique the reasoning of others.	Analyze functions using different representations	F-IF.7d (+) - Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and show end behavior.	Determine whether a function is continuous at a specified point.	Graph $f(x)=\frac{3x+2}{x-4}$ Identify zeros and asymptotes. Sketch end behaviors.		
How do mathematical ideas interconnect and build on	Numeric fluency includes both the understanding	Mathematical Practices	The Standards for Mathematical Practice describe	SMP.6 - Attend to precision.	Find limits using properties of limits.	Consider the piecewise function defined by:		

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one another to produce a coherent whole?	of and the ability to appropriately use numbers		varieties of expertise that mathematics educators at all levels should seek to develop in their students.			$f(x)=\begin{cases}-1 \text{ if } x<1\\ \sqrt{2x-1} \text{ if } x\geq 1\end{cases}$ Find the limit, if it exists (a) $\left[\lim_{x\to 1^-} f(x)\right]$ (b) $\left[\lim_{x\to 1^+} f(x)\right]$ (c) $\left[\lim_{x\to 1} f(x)\right]$		
How do mathematical ideas interconnect and build on one another to produce a coherent whole?	Numeric fluency includes both the understanding of and the ability to appropriately use numbers	Mathematical Practices	The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.	SMP.7 - Look for and make use of structure.	Find the slope of a tangent line to a curve at a given point and write the equation of the tangent line.	Find the slope of a tangent line to a curve at a given point and write the equation of the tangent line. $y=3x^2-5x$ $P(2,2)$		
Unit: Probability **Pacing: CP – 6 days** **H – 4 days**						Common Unit Assessment		
How can experimental and theoretical probabilities be used to make predictions and draw conclusions?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Using Probability to Make Decisions SMP 4 – Model with mathematics.	Calculate expected values and use them to solve problems.	S.MD.1 (+) - Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability	Be able to substitute values for real life outcomes. Calculate a probability distribution.	Construct a probability distribution for the number of tails flipped over 10 tries by assigning 1 for heads and 2 for tails. Graph the distribution.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

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				distribution using the same graphical displays as for data distributions.				
How can experimental and theoretical probabilities be used to make predictions and draw conclusions?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Using Probability to Make Decisions SMP 4 – Model with mathematics.	Calculate expected values and use them to solve problems.	S.MD.2 (+) - Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	Calculate the mean of a probability distribution.	A grocery store finds that in a crate of tomatoes, 95% have no rotten tomatoes, 2% carry one rotten tomato, 2% carry two rotten tomatoes, and 1% carry three rotten tomatoes. Find the mean number of rotten tomatoes in the crate.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
How can experimental and theoretical probabilities be used to make predictions and draw conclusions?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Using Probability to Make Decisions SMP 4 – Model with mathematics.	Calculate expected values and use them to solve problems.	S.MD.3 (+) - Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.	Calculate a probability distribution based on theoretical probability.	Construct a probability distribution for the sum of two number cubes. Find the expected value of rolling a 10.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.
How can experimental and theoretical probabilities be used to make predictions and draw conclusions?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Using Probability to Make Decisions SMP 4 – Model with mathematics.	Calculate expected values and use them to solve problems.	S.MD.4 (+) - Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned	Assign probabilities empirically.	Divya spends all of her free time playing with her building blocks. She owns building block sets with 3 pieces, 5pieces, and 10 pieces.		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

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				empirically; find the expected value.		Divya knows she owns 5 sets with 5 pieces and 2 sets with 10 pieces. She also knows that she averages 5pieces per set. How many 3 piece sets does she own?		
How can experimental and theoretical probabilities be used to make predictions and draw conclusions?	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	Using Probability to Make Decisions SMP 4 – Model with mathematics.	Use probability to evaluate outcomes of decisions.	S.MD.5 (+) - Find the expected payoff for a game of chance. (+) Evaluate and compare strategies on the basis of expected values.	Predict and make decisions on a cost basis based on data collected and simulations.	The City of Minneapolis performs 800 simulations of a car going through the intersection with a stoplight and with a stop sign. Once they decide whether to install a stoplight or a stop sign, they expect 4000 cars to travel through the intersection in the next year. Based on the tables, what is the expected damage at this intersection in the next year if the City of Minneapolis installs a stoplight?		9.1.12.A.1 - Apply critical thinking and problem-solving strategies during structured learning experiences.

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						What is the expected damage at this intersection in the next year if the City of Minneapolis installs a stop sign?		
Final Exam **Pacing: 1 Day**								