Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: The Complex Number System (N-CN)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Perform arithmetic operations with complex numbers	1. know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.	MA 3.4,5	Strategic Thinking	1. Given a+4i=7-bi find a and b.	1. Given (x+2)+5i=3+8yi solve for x and y.
	2. use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.			2. Simplify (3-2i)(2+4i)	2. Simplify (5+8i)(5-8i)
	3. (+) find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.			3. Simplify (5+2i)/(3-i)	3. Simplify (2+3i)/(2-i) (SMP 2,6,7,8)

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Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Represent complex numbers and their operations on the complex plane	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. 5. (+) represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, (–1 + √3 i)3 = 8 because (–1 + √3 i) has modulus 2 and argument 120°.	MA 3.4,5	Strategic Thinking	4. Graph 4+5i in the complex coordinate plane. 5. Given (-2+i)5 find the modulus and the argument.	4.Determine which quadrant 4+5i is located in. 5. Know that (–1 + √3 i)3 = 8 because (–1 + √3 i) has modulus 2 and argument 120°.

Subject Area: Trigonometry/Pre-Calculus					
CCSS Conceptual Category: Number and Quantity					
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Show-Me Standards					
CCSS Cluster	**Common Core Standard (D)=District Standard**	**Show Me Standards**	**DOK**	**Instructional Strategies Student Activities/Resources**	**Assessment**
	The students will:				
Use complex numbers in polynomial identities and equations	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.	MA 3.4,5	Strategic Thinking	6. Find the distance between (3-i) and (2+i).	6. Find the midpoint of (3-i) and (2+i) (SMP 2,5,7)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: Vector and Matrix Quantities (N-VM)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Represent and model with vector quantities	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||, v). 2. (+) find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. 3. (+) solve problems involving velocity and other quantities that can be represented by vectors.	MA 1.5,8	Strategic Thinking	1. Given vector u=(-1,3) and vector v=(2,4) find u+v. 2. Given the initial vector (3,4) and the terminal vector (7,8) find the resulting component vector. 3. A ball is thrown with an initial velocity of 70 ft/sec, at an angle of 35° with the horizontal. Find the vertical and horizontal components of the velocity.	1. Use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). 2. Given the initial vector (5,6) and the terminal vector (12,15) find the resulting component vector. 3. A gun with a muzzle velocity of 1200 ft/sec is fired at an angle of 6° with the horizontal. Find the vertical and horizontal components of the velocity. (SMP 1,2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: Vector and Matrix Quantities (N-VM)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Perform operations on vectors	4. (+) add and subtract vectors. a. 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. b. given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. c. understand vector subtraction v – w as v + (–w), where –w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.	MA 1.5,8	Strategic Thinking	4. Let vector v=(-2,5) and vector w=(3,4) find the sum, difference, magnitude and direction of these two vectors. Then graph the sum.	4. Let vector x=(1,3) and vector y=(-3,6) find the sum, difference, magnitude and direction of these two vectors. Then graph the difference. (SMP 2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: Vector and Matrix Quantities (N-VM)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Perform operations on matrices and use matrices in applications	5. (+) multiply a vector by a scalar. a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(vx, vy) = (cvx, cvy). b. compute the magnitude of a scalar multiple cv using ‖cv‖ = |c|v. Compute the direction of cv knowing that when |c|v ≠ 0, the direction of cv is either along v (for c > 0) or against v (for c < 0). 6. (+) use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.	MA 1 1.6 MA5 1.10	Strategic Thinking	5. Let vector v=(-1,4) find and graph 2v. 6. Using matrix multiplication, incode the account number from a given credit card number.	5. Let vector v=(-10,6) find and graph 3v. 6.Given a square matrix, find the inverse. (SMP 2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: Vector and Matrix Quantities (N-VM)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Perform operations on matrices and use matrices in applications	7. (+) multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.	MA 1 MA5 1.6 1.10	Strategic Thinking	7. Given a 3x3 matrix find its scalar product when the scalar equals -2.	7. Given a 2x4 matrix, find the scalar product when the scalar equals 5.
	8. (+) add, subtract, and multiply matrices of appropriate dimensions.			8. Given a 2x3 and a 3x4 matrix, find their sum, difference and product.	8. Given a 2x2 and 2x4 matrix, find their sum, difference and product, if possible.
	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.			9. Given a variety of matrices, show that some pairs can be multiplied while others cannot.	9. Given a variety of matrices, show that some can be added, subtracted and multiplied, while others cannot. (SMP 1,2,3,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Number and Quantity

CCSS Domain: Vector and Matrix Quantities (N-VM)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Perform operations on matrices and use matrices in applications	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 the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	MA 1 MA5 1.6 1.10	Strategic Thinking	10. Given a 3x3 zero matrix, show that the product of the matrix and another given matrix of appropriate dimensions is 0.	10. Given a 3x3 identity matrix, show that the product of the matrix and another given matrix of appropriate dimensions is again the given matrix.
	11. (+) multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.			11. Given a 3x1 matrix and a 1x4 matrix, show that their product is a vector.	11. Given a 2x1 matrix and a 1x3 matrix, show that their product is a vector.
	12. (+) work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.			12. Given a triangle with vertices (1,3), (2,-4), (7,8) use the correct determinant formula to find area.	12. Given a triangle with vertices (2,8), (-1,-3) and (0,5) use the correct determinant formula to find area. (SMP 1,2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Algebra

CCSS Domain: Seeing Structure in Expressions (A-SSE)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Interpret the structure of expressions	4. derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. ★ Arithmetic with Polynomials and Rational Expressions	MA 5 1.6	Strategic Thinking	4. For the sum Sn, why is the last term of the series a_1r^{n-1} and not a_1r^n?	4. In January the Smith family starts saving for a trip to Hawaii. In August, the Smiths expect the vacation to cost $5,375. They start with $525 and each month plan to deposit 20% more than the previous month. Will they have enough money for the trip? In your solution show the derivation and use the formula. (SMP 4,7,8)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Algebra

CCSS Domain: Reasoning with Equations and Inequalities (A-REI)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Understand solving equations as a process of reasoning and explain the reasoning	8. (+) represent a system of linear equations as a single matrix equation in a vector variable. 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).	2.7	Strategic Thinking	8. Given a 2x2 system of linear equations, form and solve the matrix equation. 9. Given a 3x3 system of linear equations, use a graphing calculator to find the inverse of the associated matrix. And use the inverse to solve the system.	8. Solve -6x+3y=8 and 4x-2y=10 using a matrix equation. 9. Solve x+y+z=4, 4x+5y=4 and y-3z=-9 using inverse matrices on the graphing calculator. (SMP 1,2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Algebra

CCSS Domain: Reasoning with Equations and Inequalities (A-REI)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Solve equations and inequalities in one variable	11. explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	MA 3 1.5, 1.8	Skill/Concept	11. Solve the system: 7x-y=6 -7x+y=-6	11. Solve linear, polynomial, rational, absolute value, exponential and logarithmic systems of equations graphically and algebraically. (SMP 2,4,5,6)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Interpreting Functions (F-IF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Understand the concept of a function and use function notation	7. graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ b. graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. (+) graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	MA 1, 5 1.4, 1.8	Strategic Thinking	7. Given f(x)=x2 graph and give vertex point, axis of symmetry equation, and direction of opening. 7b. Graph y=√x+2 7c. Graph y=(x-1)(x+2)(x-3) 7d. Given f(x)=(x2+1)/(x+1) graph showing zeros, asymptotes and end behavior. 7e. Graph y=2x	7. Distinguish between graphs that are parabolas and absolute value functions. 7b. Distinguish between square root and absolute value functions, then graph. 7c. Graph polynomial functions using zeros and a sign graph. 7d. Explain how to find zeros and equations of all asymptotes in a given rational function. 7e. Identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay. (SMP 2,4,5,6,7)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Building Functions (F-BF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Build a function that models a relationship between two quantities	1. write a function that describes a relationship between two quantities.★ c. (+) compose functions.	1.6, 1.7	Strategic Thinking	1c. 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.	1c. The weekly cost C of producing x units in manufacturing is given by C(x)=60x+7.50. The number of units, x, produced in t hours is given by x(t)=50t. Find the time that must elapse for the cost to increase to $15,000. (SMP 1,2,4)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Building Functions (F-BF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Build new functions from existing functions	4. find inverse functions. b. (+) verify by composition that one function is the inverse of another. c. (+) read values of an inverse function from a graph or a table, given that the function has an inverse. d. (+) produce an invertible function from a non-invertible function by restricting the domain. 5. (+) understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	3.4	Strategic Thinking	4b. Let f(x)=1+x and g(x)=x-1. Show that f(g(x))=g(f(x))=x. 4c. If f and g are inverses and f(2)=3, find g(3). 4d. Given f(x)=x2 restrict the domain so the function can have an inverse. 5. Find $\log_2 8$.	4b.Using composition, how do you determine if two functions are inverses? 4c. State the equation of symmetry for two inverse functions. 4d. Given a basic parabola equation, using the vertex, how many different equations can be formed by using the inverse? 5. Rewrite $2^4=16$ in logarithmic form. (SMP 1,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Trigonometric Function (F-TF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Extend the domain of trigonometric functions using the unit circle	1. understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number.	3.4	Strategic Thinking	1. What is the measure of the arc formed by the slice of pie with a radius of 12 inches and a central angle of 60°. State your answer in radians. 2. Sketch a unit circle and find the sine of 150°. 3. Find the sine, cosine, and tangent of 5π/3.	1. Given various radii and central angles on provided diagrams, convert to radian measures and solve. 2. Use the unit circle to evaluate trigonometric functions at various angles. 3. Find the sine, cosine and tangent of 0. (SMP 2,3,6)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Trigonometric Function (F-TF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Model periodic phenomena with trigonometric functions	4. (+) use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. 5. choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ 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. 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.★	MA2 MA4 1.6 3.2 , 1.5, 1.8	Strategic Thinking	4. Which trig functions are even? 5. The function given by p=100-20(cos 5πt/3) approximates the blood pressure p in millimeters of mercury at time t, in seconds, for a person at rest. Find the amplitude and period of the function. 6. Graph y=sinx. Determine the restriction on the domain so that the inverse of the function exists. 7. Solve cos2x=-1/2 for all possible x values.	4. Which trig functions are odd? 5. When tuning a piano a technician strikes a tuning fork for the A above middle C and sets up a wave motion that can be approximated by y=.001sin880πt, where t is the time in seconds. What is the period of the function? 6. Graph y=cosx. Determine the restriction on the domain so that the inverse of the function exists. 7. Solve sin2x=1/2 for all possible x values. (SMP 1,2,3,4)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Functions

CCSS Domain: Trigonometric Function (F-TF)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Prove and apply trigonometric identities	8. prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.	MA2 1.6 3.4, 1.2	Strategic Thinking	8. Using the Pythagorean Theorem and definitions of sine and cosine, prove the Pythagorean Identity.	8. Given the unit circle and an ordered pair (3,4) find the sine, cosine and tangent.
	9. (+) prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.			9. Using the Distance Formula, develop the sum and difference formulas.	9. Use the sum formula to find the sine of 75°. (SMP 1,2,3,4)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Geometry

CCSS Domain: Similarity, Right Triangles, and Trigonometry (G-SRT)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Understand similarity in terms of similarity transformations	9. (+) derive the formula A=1/2absin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.		Skill/Strategic Thinking	9. Given a triangle, students will draw an altitude and derive the area by using sine.	9. Given triangle ABC, find the area given b=5, c=10, the measure of angle A=31°.
	10. (+) prove the Laws of Sines and Cosines and use them to solve problems.	MA 2 3.2, 3.3		10. Given a triangle, students will solve for the angle using the Law of Sines or Law of Cosines.	10. In triangle RST r=9, t=7, and the measure of angle R=110°. What is the measure of angle S?
	11. (+) understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).			11. Using the Law of Sines and the Law of Cosines, solve a real world problem.	11. A landscaper sights the top of a tree at a 68° angle. She then moves an additional 70 ft directly away from the tree and sights the top at a 43° angle. How tall is the tree to the nearest tenth of a foot?

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Geometry

CCSS Domain: Expressing Geometric Properties with Equations (G-GPE)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Translate between the geometric description and the equation for a conic section	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.	MA2 3.3, 1.2	Strategic Thinking	3. Discuss and demonstrate the difference between ellipses and hyperbolas and their respective foci.	3. Given $4x^2+16y^2+8x-4y-9=0$ determine if its an ellipse or hyperbola and find the coordinates of the foci. (SMP 1,2,4,5)

Subject Area: Trigonometry/Pre-Calculus

CCSS Conceptual Category: Geometry

CCSS Domain: Geometric Measurement and Dimension (G-GMD)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Explain volume formulas and use them to solve problems	2. (+) give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.	3.4, 3.5	Strategic Thinking	Discuss and demonstrate Cavalieri's Principle using a variety of 3-dimensional solids.	By comparison of a cone and a cylinder, with the same base, justify the volume of a sphere. (SMP 1,2,3,5)