Advanced Math Plus
2018-19 Pacing Guide

	Standard	Term 1	Term 2	Term 3	Term 4
N-CN	**The Real Number System**				
	N-CN.3 Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.	✓		✓	
	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.	✓		✓	
	N-CN.5 Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example, $(-1 + \sqrt{3}\, i)^3 = 8$ because $(-1 + \sqrt{3}\, i)$ has modulus 2 and argument 120°.*	✓		✓	
	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.	✓		✓	
	N-CN.8 Extend polynomial identities to the complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.*	✓		✓	
	N-CN.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	✓		✓	
N-VM	**Vector and Matrix 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., $\boldsymbol{v}$, $\lvert\boldsymbol{v}\rvert$, $\lVert\boldsymbol{v}\rVert$, v).		✓		✓
	N-VM.2 Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.		✓		✓
	N-VM.3 Solve problems involving velocity and other quantities that can be represented by vectors.		✓		✓
	N-VM.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 $\boldsymbol{v} - \boldsymbol{w}$ as $\boldsymbol{v} + (-\boldsymbol{w})$, where $-\boldsymbol{w}$ is the additive inverse of $\boldsymbol{w}$, with the same magnitude as $\boldsymbol{w}$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.		✓		✓
	N-VM.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 $c(v_x, v_y) = (cv_x, cv_y)$. b. Compute the magnitude of a scalar multiple $c\boldsymbol{v}$ using $\lVert c\boldsymbol{v}\rVert = \lvert c\rvert\boldsymbol{v}$. Compute the direction of $c\boldsymbol{v}$ knowing that when $\lvert c\rvert\boldsymbol{v} \neq 0$, the direction of $c\boldsymbol{v}$ is either along $\boldsymbol{v}$ (for $c > 0$) or against $\boldsymbol{v}$ (for $c < 0$).		✓		✓
	N-VM.6 Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.	✓		✓	
	N-VM.7 Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.	✓		✓	
	N-VM.8 Add, subtract, and multiply matrices of appropriate dimensions.	✓		✓	

	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.	✓		✓	
	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 the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	✓		✓	
	N-VM.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.	✓		✓	
	N-VM.12 Work with 2 × 2 matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area.	✓		✓	
A-APR	**Arithmetic with Polynomials and Rational Expressions**				
	A-APR.5 Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]		✓		✓
	A-APR.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.	✓		✓	
A-REI	**Reasoning with Equations and Inequalities**				
	A-REI.8 Represent a system of linear equations as a single matrix equation in a vector variable.	✓		✓	
	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).	✓		✓	
F-IF	**Building Functions**				
	F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	✓		✓	
F-BF	**Building Functions**				
	F.BF.1 Write a function that describes a relationship between two quantities.* 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 location of the weather balloon as a function of time*.	✓		✓	
	F.BF.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.	✓		✓	
	F.BF.5 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	✓		✓	
F-TF	**Trigonometric Functions**				
	F.TF.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 x, π + x, and 2π – x in terms of their values for x, where x is any real number.		✓		✓
	F.TF.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.		✓		✓
	F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*		✓		✓
	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.		✓		✓
	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		✓		✓
	F.TF.9 Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.		✓		✓

G-SRT	**Similarity, Right Triangles, and Trigonometry**				
	G-SRT.9 Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.		✓		✓
	G-SRT.10 Prove the Laws of Sines and Cosines and use them to solve problems.		✓		✓
	G-SRT.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).		✓		✓
G-C	**Understand and apply theorems about circles**				
	G-C.4 Construct a tangent line from a point outside a given circle to the circle.		✓		✓
G-GPE	**Expressing Geometric Properties with Equations**				
	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.	✓		✓	
G-GMD	Geometric Measurement and Dimension				
	G-GMD.2 Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.	✓		✓	
S-CP	**Conditional Probability and the Rules of Probability**				
	S-CP.8 Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.		✓		✓
	s-CP.9 Use permutations and combinations to compute probabilities of compound events and solve problems.		✓		✓
S-MD	Using Probability to Make Decisions				
	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 distribution using the same graphical displays as for data distributions.		✓		✓
	S-MD.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.		✓		✓
	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. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*		✓		✓
	S-MD.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*		✓		✓
	S-MD.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.* b. Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*		✓		✓
	S-MD.6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).		✓		✓
	S-MD.7 Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).		✓		✓