Adair County High School

2020-2021

9-12 MATH STANDARDS - Conceptual Category Number and Quantity / PACING GUIDE

5 Key Skills

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Number and Quantity - The Real Number System

Cluster: Extend the properties of exponents to rational exponents

Standard	Learning Target We are learning to.....	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.1 (MP.2, MP.7) Extend the properties of integer exponents to rational exponents, allowing for the expression of radicals in terms of rational exponents	**extend the properties of integer exponents to rational exponents.**	**Unit - Exponent Rules** **Unit - Radical Functions** **Unit - Prerequisites**	**Rational exponent** **Power** **Roots**	**Kuta Software** **All Things Algebra I - Exponent Rules** **Kuta Software** **All Things Algebra II- Radical Functions** **Pre Calculus/Larson and Hostetler** **Unit Prerequisites** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
KY.HS.N.2 (MP.7) Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**rewrite expressions involving radicals and rational exponents.**	**Unit - Exponent Rules** **Unit - Radical Functions** **Unit - Prerequisites**	**Radical expressions** **Rational exponents** **Properties of exponents**	**Kuta Software** **All Things Algebra I - Exponent Rules** **KUTA Software** **All Things Algebra II - Radical Functions** **Pre Calculus/Larson and Hostetler** **Unit Prerequisites** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**

Number and Quantity - The Real Number System

Cluster: Use properties of rational and irrational numbers

Standard	Learning Target We are learning to…….	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.3 (+) (MP.3, MP.6) Justify why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	**justify the sum or product of two rational numbers is rational.** **the sum of a rational number and an irrational number is irrational.** **the product of a nonzero rational number and an irrational number is irrational.**		**Rational number** **Irrational number** **Divisor**		**N/A**

Number and Quantity - Quantities

Cluster: Reason quantitatively and use units to solve problems

Standard	Learning Target We are learning to……	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.4 Use units in context as a way to understand problems and to guide the solution of multi-step problems; ★(MP.5, MP.6)					
a. Choose and interpret units consistently in formulas;	**Choose and interpret units consistently.**	**Unit - Volume & Surface Area** **Unit - Prerequisites**	**Appropriate units**	**Kuta Software** **All Things Algebra - Volume and Surface Area** **Pre Calculus/Larson and Hostetler** **Unit Prerequisites** **Kuta Software**	**Geometry** **Pre-Calculus**
b. Choose and interpret the scale and the origin in graphs and data displays.	**Choose and interpret an appropriate scale for graphs and data displays.**	**Unit - Relations & Functions** **Unit - Linear Equations**	**Line graphs** **Circle graphs** **Histogram** **Scatter plot** **Bar graphs** **Scale**	**Kuta Software** **All Things Algebra I- Relations & Functions & Linear Equations** **All Things Algebra II - Exponential & Logarithmic Functions**	**Algebra I**

		Unit - Exponential & Logarithmic Functions **Unit - Prerequisites**		**KUTA software** **Pre Calculus/Larson and Hostetler Unit Prerequisites** **Kuta Software**	**Algebra II** **Pre-Calculus**
KY.HS.N.5 (MP.1, MP.6) Define appropriate units in context for the purpose of descriptive modeling ★	**Define appropriate contextual units for the purpose of descriptive modeling.**	**Unit - Linear Equations** **Unit - Linear Functions** **Unit - Exponential & Logarithmic Functions** **Unit - Solving Quadratics & Complex Numbers** **Unit - Functions and Their Graphs**	**Precision** **Unit measurements** **modeling**	**Kuta Software** **All Things Algebra I - Linear Equations** **All Things Algebra II - Linear Functions, Exponential & Logarithmic Functions, Solving Quadratic** **All Things Algebra - Volume and Surface Area** **KUTA Software** **Pre Calculus/Larson and Hostetler Unit Functions and Their Graphs** **Kuta Software**	**Algebra I** **Algebra II** **Geometry** **Pre-Calculus**
KY.HS.N.6 (MP.2, MP.6) Choose a level of accuracy appropriate to limitations on measurement when reporting quantities ★	**Choose appropriate levels of accuracy on measurements.**	**Unit - Embedded** **Unit - Embedded** **Unit - Functions and Their Graphs**	**Precision** **Scientific notation** **Estimates**	**Kuta Software** **All Things Algebra I - embedded** **All Things Algebra II - embedded** **All Things Algebra** **Pre Calculus/Larson and Hostetler Unit Functions and Their Graphs** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**

Number and Quantity - The Complex Number System

Cluster: Perform arithmetic operations with complex numbers

Standard	Learning Target We are learning to.....	Windows of instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.7 Understanding the properties of complex numbers. (MP.7, MP.8)					
a. 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.	**Identify and write numbers in complex form.** $i^2 = -1$	**Unit - Quadratic Equations** **Unit - Solving Quadratics & Complex Numbers** **Unit - Polynomial & Rational Functions**	**Complex number** **Imaginary number**	**Kuta Software** **All Things Algebra I- Quadratic Equations** **All Things Algebra II - Solving Quadratics & Complex Numbers** **KUTA Software** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
b. Use the relation $i^2 = -1$ and the commutative, associative and distributive properties to add, subtract and multiply complex numbers.	**Add, subtract and multiply complex numbers.**	**Unit - Quadratic Equations** **Unit - Solving Quadratics & Complex Numbers** **Unit - Polynomial & Rational Funtions**	**Commutative property** **Associative property** **Distributive property**	**Kuta Software** **All Things Algebra I - Quadratic Equations** **KUTA Software** **All Things Algebra II - Solving Quadratics & Complex Numbers** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
c. (+) Find the conjugate of a complex number and use it to find the quotient of complex numbers.	**Find the conjugate of complex numbers.** **Find the quotient of complex numbers.**	**Unit - Solving Quadratics & Complex Numbers** **Unit - Polynomial**	**Complex number** **Conjugate** **Imaginary number** **quotient**	**Kuta Software** **All Things Algebra II - Solving Quadratics & Complex Numbers** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions**	**Algebra II**

		& Rational Functions		**Kuta Software**	**Pre-Calculus**

Number and Quantity - The Complex Number System

Cluster: Represent complex numbers and their operations on the complex plane

Standard	Learning Target We are learning to…….	Windows of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.8 (+) Understanding representations of complex numbers using the complex plane. (MP.2, MP.5)					
a. 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.	**Represent complex numbers on the complex plane in rectangular and polar form.** **Why the rectangular and polar forms of a complex number represent the same number.**	**Unit - Polynomial & Rational Functions**	**Complex number** **Complex plane** **Polar form** **Real numbers** **Imaginary numbers**	**Pre-Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Pre-Calculus**
b. Represent addition, subtraction, multiplication, modulus and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.	Represent addition, subtraction, multiplication, modulus and conjugation of complex numbers geometrically.	**Unit - Solving Quadratics & Complex Numbers** **Unit - Polynomial & Rational Functions**	**Modulus** **Conjugation** **Complex plane**	**Kuta Software** **All Things Algebra II - Solving Quadratics & Complex Numbers** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra II** **Pre-Calculus**
c. 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.	**Calculate the distance between numbers in the complex plane.**	**Unit - Polynomial & Rational Functions**	**Distance** **Complex plane** **Midpoint** **Modulus**	**Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Pre-Calculus**

Number and Quantity - The Complex Number System

Cluster: Use complex numbers in polynomial identities and equations

Standard	Learning Target We are learning to…..	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.9 (MP.1, MP.2) Solve quadratic equations with real coefficients that have complex solutions.	**Solve quadratic equations that have complex solutions.**	**Unit - Quadratic Equations** **Unit - Solving Quadratics & Complex Numbers** **Unit - Polynomial & Rational Functions**	**Quadratic equation** **Coefficient** **Complex solution** **Quadratic formula**	**Kuta Software** **All Things Algebra I - Quadratic Equations** **All Things Algebra II - Solving Quadratics & Complex Numbers** **KUTA Software** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
KY.HS.N.10 (+) (MP.7, MP.8) Extend polynomial identities to the complex numbers	**Apply polynomial identities to the complex numbers.**	**Unit - Quadratic Equations** **Unit - Polynomial & Rational Functions**	**Polynomial** **Complex numbers** **Complex binomials**	**Kuta Software** **All Things Algebra I - Quadratic Equations** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Pre-Calculus**
KY.HS.N.11(+) (MP.1, MP.3) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	**The fundamental theorem of algebra.**	**Unit - Polynomial Functions** **Unit - Polynomial & Functions**	**Fundamental Theorem of Algebra** **Quadratic polynomials**	**Kuta Software** **All Things - Algebra II - Polynomial Functions** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra II** **Pre-Calculus**

Number and Quantity - Vector and Matrix Quantities

Cluster: Represent and model with vector quantities

Standard	Learning Target We are learning to…..	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.12 (+) Understand and apply properties of vectors (MP.1, MP.6)					
a. 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.	**Recognize vector quantities as having both magnitude and direction.** **Represent vector quantities by directed line segments.** **Use appropriate symbols for vectors and magnitudes.**		**Vectors** **Magnitude** **Direction** **Angles**		**N/A**
b. Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	**Find the components of a vector.**		**Vectors** **Initial point** **Terminal point** **Horizontal and vertical components**		**N/A**
c. Solve problems involving velocity and other quantities that can be represented by vectors.	Solve problems involving velocity and other quantities that can be represented by vectors.		**Velocity** **vectors**		**N/A**

Number and Quantity - Vector and Matrix Quantities

Cluster: Perform operations on vectors

Standard	Learning Target We are learning to…..	Window of Instruction (weeks)	Essential Vocabulary	Resources	Course Name
KY.HS.N.13 (+) Perform operations with vectors (addition, subtraction, and multi coplication by a scalar). (MP.3, MP.7)					

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.	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.		**Vectors** **Component wise** **Magnitude**		**N/A**
b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.	**Find the magnitude and direction of the sum of two vectors.**		**Vectors** **Magnitude** **Direction**		**N/A**
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.	Represent vector subtraction graphically by connecting the tips in the appropriate order and perform vector subtraction component-wise.		**Vector** **Additive inverse** **Magnitude** **Component-wise**		**N/A**
d. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise.	Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise.		**Scalar multiplication** **Vector**		**N/A**
e. Compute the magnitude of a scalar multiple *cv* using $\|\|cv\|\| = \|c\| v$. Compute the direction of *cv* knowing that when $\|c\| v \neq 0$, the direction of *cv* is either along *v*(for c>0) or against *v* (for c<0).	Compute the magnitude and direction of a scalar multiple *cv*.		**Magnitude** **Scalar multiplication**		**N/A**

Number and Quantity - Vector and Matrix Quantities

Cluster: Perform operations on matrices and use matrices in applications.

Standard	Learning Target We are learning to…..	Window of Instruction	Essential Vocabulary	Resources	Course Name

		(weeks)			
KY.HS.N.14 Use matrices to represent and manipulate data. (MP.4, MP.5)	**Use matrices to represent and manipulate data.**	**Unit - Multi-Step Equations** **Unit - Matrix** **Unit - Matrices & Determinants**	**Matrix** **Elements** **Dimensions**	**Kuta Software** **All Things Algebra I - Multi-step Equations** **All Things Algebra II - Matrix Unit** **KUTA Software** **Pre Calculus/Larson and Hostetler** **Unit Matrices and Determinants** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
KY.HS.N.15 Perform operations with matrices (MP.7, MP.8)					
a. Add, subtract and multiply matrices of appropriate dimensions.	**Add, subtract, and multiply matrices**	**Unit - Multi-Step Equations** **Unit - Matrix** **Unit - Polynomial & Rational Functions**	**Matrix** **dimensions**	**Kuta Software** **All Things Algebra I - Multi-Step Equations** **All Things Algebra II - Matrix Unit** **KUTA Software** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**
b. Multiply matrices by scalars to produce new matrices.	**Multiply matrices by scalars to produce new matrices.**	**Unit - Multi-step Equations** **Unit - Matrix Unit** **Unit - Polynomial &**	**Scalars** **Matrix**	**Kuta Software** **All Things Algebra I - Multi-step Equations** **All Things Algebra II - Matrix Unit** **KUTA Software** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra I** **Algebra II** **Pre-Calculus**

		Rational Functions			
KY.HS.N.16 (+) Understand properties of square and identity matrices (MP.3, MP.7)					
a. Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	**Understand multiplication of matrices.**	**Unit - Matrix** **Unit - Polynomial & Rational Functions**	**Square matrix** **Commutative property** **Associative property** **Distributive property**	**Kuta Software** **All Things Algebra II - Matrix Unit** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra II** **Pre-Calculus**
b. 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.	**To understand the role of the zero and identity matrix.** **Understand the determinant of a matrix.**	**Unit - Matrix** **Unit - Polynomial & Rational Functions**	**Zero matrix** **Identity matrix** **Determinant** **Multiplicative inverse**	**Kuta Software** **All Things Algebra II- Matrix Unit** **Pre Calculus/Larson and Hostetler** **Unit Polynomial and Rational Functions** **Kuta Software**	**Algebra II** **Pre-Calculus**
c. Work with 2 x 2 matrices as transformations of the plane and interpret the absolute value of the determinant in terms of area.	**Work with 2 x 2 matrices as transformations of the plane and interpret the absolute value of the determinant in terms of area.**		**Transformation** **Plane** **Absolute value** **Determinant**	**Kuta Software**	**N/A**