Magoffin County Schools' Curriculum Resources

"Building a Better Future for Every Child - Every Day!"

Summer 2011

Subject Content: Algebra 2 Grade : 11

Indicates the Curriculum Map

(TO BE USED THROUGHOUT ENTIRE COURSE)

B. Exploring the Skills and Strategies Underlying Mathematics

1. Mathematical Processes Learned in the Context of Increasingly Complex Mathematical and Real-World Problems

a. Apply problem-solving skills (e.g., identifying irrelevant or missing information, making conjectures, extracting mathematical meaning, recognizing and performing multiple steps when needed, verifying results in the context of the problem) to the solution of real-world problems
b. Use a variety of strategies to set up and solve increasingly complex problems
c. Represent data, real-world situations, and solutions in increasingly complex contexts (e.g., expressions, formulas, tables, charts, graphs, relations, functions) and understand the relationships
d. Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
e. Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
f. Make mathematical connections among concepts, across disciplines, and in everyday experiences
g. Demonstrate the appropriate role of technology (e.g., calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
h. Apply previously learned algebraic and geometric concepts to more advances problems

NOTE: Possible Gaps

1-3 weeks	4-6 weeks	7-9 weeks
• Introduction to Algebra II- The Purpose and Predictability of Patterns (15)	• Linear Equations & Inequalities (15)	• Matrices (10) * • Functions, Relations (5)
10-12 weeks	**13-15 weeks**	**16-18 weeks**
• Conics (15)	• Quadratic Equations, Inequalities, & Functions (15)	• Polynomials (15) *Possible Gaps from Alg. 1: Factoring Polynomials, Rules of Exponents*
19-21 weeks	**22-24 weeks**	**25-27 weeks**
• Rational & Radical Expressions & Equations (15)	• Exponential & Logarithmic Functions (15)	• Trigonometry (15)
28-30 weeks	**31-33 weeks**	**34-36 weeks**
• Probability (15)	• Data Analysis (15)	• Review

1-3 weeks

Introduction to Algebra II- The Purpose and Predictability of Patterns (15)

CURRICULUM

ACT Quality Core

A. Prerequisites

1. SKILLS ACQUIRED BY STUDENTS IN A PREVIOUS COURSE AND REFINED IN THIS COURSE

a. Identify properties of real numbers and use them and the correct order of operations to simplify expressions
j. Use inductive reasoning to make conjectures and deductive reasoning to arrive at valid conclusions

H. Organizing and Analyzing Data and Applying Probability

2. Sequences and Series

a. Find the *n*th term of an arithmetic or geometric sequence
b. Find the position of a given term of an arithmetic or geometric sequence
c. Find sums of a finite arithmetic or geometric series
d. Use sequences and series to solve real-world problems
e. Use sigma notation to express sums

Common Core Standards

- A.SSE.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.
- C.9-12.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.
- A.SSE.2 Use the structure of an expression to identify ways to rewrite it.

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
A.SSE.4	• Find the first term in a geometric sequence given at least two other terms. • Define a geometric series as a series with a constant ratio between successive terms. Use the formula to solve problems. • Note from Appendix A: Consider extending A.SSE.4 to infinite geometric series in curricular implementations of this course description.	• Derive a formula (i.e. equivalent to the formula) for the sum of a finite geometric series (when the common ratio is not 1). • Note from Appendix A: Consider extending A.SSE.4 to infinite geometric series in curricular implementations of this course description.		
A.SSE.1b	The underpinning knowledge for this standard is addressed in • A.SSE.1a: For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. • Note from Appendix A: extend to polynomial and rational expressions	• For expressions that represent a contextual quantity, interpret complicated expressions, in terms of the context, by viewing one or more of their parts as a single entity. • Note from Appendix A: extend to polynomial and rational expressions		
A.SSE.2	• Identify ways to rewrite expressions, such as difference of squares, factoring out a common monomial, regrouping, etc. • Identify various structures of expressions (e.g. an exponential monomial multiplied by a scalar of the same base, difference of squares in terms other than just x) • Note from Appendix A: Extend to polynomial and rational expressions.	• Use the structure of an expression to identify ways to rewrite it. • Classify expressions by structure and develop strategies to assist in classification. • Note from Appendix A: Extend to polynomial and rational expressions.		

Critical Vocabulary

Arithmetic Sequence	Arithmetic Mean	Arithmetic Series	Common Difference	Summation
Geometric Sequence	Geometric Mean	Geometric Series	Common Ratio	Sigma
n^{th} Term	Finite	Infinite	Constant Amount	

Suggested Strategies/Activities

Model sequences with a clothesline, two-column tables, counting objects, and graphs.	Play "What's my rule?" Support/Refute	Vocabulary Rating Menu from a pizza place

Balanced Assessment:

Formative Examples

Exit Slips, Journals, Gallery Walks, Self-evaluation Stop Light, Random Questioning

Summative

Common (PLC Teams will design the common assessments, i.e., grade level, and/or depts..)

Resources Needed

Prentice Hall Algebra 2 textbook, student companion	http://www.mathopenref.com/
Prentice Hall Algebra 2 Transition Packet for CCS	http://www.geogebra.org/cms/en/download
ACT Quality Core Algebra 2	http://www.studyisland.com
Core Standards Coach Books	

4-6 weeks

- Linear Equations & Inequalities (15)

CURRICULUM

ACT Quality Core

D. Exploring Expressions, Equations, and Functions in the First Degree

1. Expressions, Equations, and Inequalities

a. Solve linear inequalities containing absolute value
b. Solve compound inequalities containing "and" and "or" and graph the solution set
c. Solve algebraically a system containing three variables

2. Graphs, Relations, and Functions

a. Graph a system of linear inequalities in two variables with and without technology to find the solution set to the system
a. Solve linear programming problems by finding maximum and minimum values of a function over a region defined by linear inequalities

Common Core Standards

- A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
- A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
- A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.*

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
A.CED.1	• Solve all available types of equations & inequalities, including root equations & inequalities, in one variable. • Describe the relationships between the quantities in the problem (for example, how the quantities are changing or growing with respect to each other); express these relationships using mathematical operations to create an appropriate equation or inequality to solve. • Note from Appendix A: Use all available types of functions to create such equations, including root functions, but constrain to simple cases.	• Create equations and inequalities in one variable and use them to solve problems. • Create equations and inequalities in one variable to model real-world situations. • Compare and contrast problems that can be solved by different types of equations. • Note from Appendix A: Use all available types of functions to create such equations, including root functions, but constrain to simple cases.		
A.CED.2	• Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variables represent. • Graph one or more created equation on a coordinate axes with appropriate labels and scales. • Note from Appendix A: (While functions used in A.CED.2will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.)	• Create at least two equations in two or more variables to represent relationships between quantities • Justify which quantities in a mathematical problem or real-world situation are dependent and independent of one another and which operations represent those relationships. • Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables.		

CED.3	• Recognize when a modeling context involves constraints. • Note from Appendix A: While functions used will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.	• Interpret solutions as viable or nonviable options in a modeling context. • Determine when a problem should be represented by equations, inequalities, systems of equations and/ or inequalities. • Represent constraints by equations or inequalities, and by systems of equations and/or inequalities. • Note from Appendix A: While functions used will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.		
A.CED.4	• Define a “quantity of interest” to mean any numerical or algebraic quantity.			

7-9 weeks

- Matrices (10) *
- Functions, Relations (5)

CURRICULUM

ACT Quality Core

***D. Exploring Expressions, Equations, and Functions in the First Degree**
1. Expressions, Equations, and Inequalities
c. Solve algebraically a system containing three variables
I. using matrices to Organize Data and Solve Problems
1. Matrices
a. Add, subtract, and multiply matrices
b. Use addition, subtraction, and multiplication of matrices to solve real-world problems
c. Calculate the determinant of 2 × 2 and 3 × 3 matrices
d. Find the inverse of a 2 × 2 matrix
e. Solve systems of equations by using inverses of matrices and determinants
Use technology to perform operations on matrices, find determinants, and find inverses

C. Establishing Number Sense and Operation Skills
1. Foundations
d. Perform operations on functions, including function composition, and determine domain and range for each of the given functions
D. Exploring Quadratic Equations & Functions
2. Graphs, Relations, and Functions
a. Determine the domain and range of a quadratic function; graph the function with and without technology
b. Use transformations (e.g., translation, reflection) to draw the graph of a relation and determine a relation that fits a graph

Common Core Standards

- A.REI.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.*
- F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
A.REI.11	• Recognize and use function notation to represent linear, polynomial, rational, absolute value, exponential, and radical equations.	• Explain why the x-coordinates of the points where the graph of the equations y=f(x) and y=g(x) intersect are the solutions of the equations f(x)=g(x). • Approximate/find the solution(s) using an appropriate method for example, using technology to graph the functions, make tables of values or find successive approximations. • Note from Appendix A: Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions		

F.IF.5	• Given the graph or a verbal/written description of a function, identify and describe the domain of the function. • Identify an appropriate domain based on the unit, quantity, and type of function it describes. • Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context.	• Relate the domain of the function to its graph and, where applicable, to the quantitative relationship it describes. • Explain why a domain is appropriate for a given situation.		

10-12 weeks

- Conics (15)

CURRICULUM

ACT Quality Core

E. Exploring Quadratic Equations and Functions

3. Conic Sections

b. Identify conic sections (e.g., parabola, circle, ellipse, hyperbola) from their equations in standard form
c. Graph circles and parabolas and their translations from given equations or characteristics with and without technology
d. Determine characteristics of circles and parabolas from their equations and graphs
i. Identify and write equations for circles and parabolas from given characteristics and graph

Common Core Standards

Note: CCS puts Conics in Geometry

- G.GPE.2 Derive the equation of a parabola given a focus and directrix.
- G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
G.GPE.2	• Define a parabola including the relationship of the focus and the equation of the directrix to the parabolic shape. • From Appendix A: The directrix should be parallel to a coordinate axis.	• Derive the equation of parabola given the focus and directrix.		
G.GPE.4	• Recall previous understandings of coordinate geometry (including, but not limited to: distance, midpoint and slope formula, equation of a line, definitions of parallel and perpendicular lines, etc.)	• Use coordinates to prove simple geometric theorems algebraically. • For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). • e.g., derive the equation of a line through 2 points using similar right triangles.		

13-15 weeks

- Quadratic Equations, Inequalities, & Functions (15)

CURRICULUM

ACT Quality Core

C. Establishing Number Sense and Operation Skills

1. Foundations

b. Identify complex numbers and write their conjugates
c. Add, subtract, and multiply complex numbers
d. Simplify quotients of complex numbers

E. Exploring Quadratic Equations and Functions

1. Equations and Inequalities

b. Solve quadratic equations and inequalities using various techniques, including completing the square and using the quadratic formula
c. Use the discriminant to determine the number and type of roots for a given quadratic equation
d. Solve quadratic equations with complex number solutions
e. Solve quadratic systems graphically and algebraically with and without technology

2.Graph, Relations, and Functions

b. Use transformations (e.g., translation, reflection) to draw the graph of a relation and determine a relation that fits a graph
c. Graph a system of quadratic inequalities with and without technology to find the solution set to the system

Common Core Standards

- F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
- F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
- F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, a symmetry of the graph, and interpret these in terms of a context.
  b. Use the properties of exponents to interpret expressions for exponential functions. *For example: identify percen rate of change in functions such as y= (1.02)t, y=(.97)t, y=(1.01)12t, y=(1.2)t/10, and classify them as represent exponential growth or decay.*
- F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
- F.BF.1b Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
- F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
F.IF.4	• Define and recognize the key features in tables and graphs of linear, exponential, and quadratic functions: intercepts; intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, end behavior and periodicity. • Identify the type of function, given its table or graph. Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context.	• Interpret key features of graphs and tables of functions in the terms of the contextual quantities the function represents. • Sketch graphs showing key features of a function that models a relationship between two quantities from a given verbal description of the relationship. • Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context.		

F.IF.7b	• Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions, by hand in simple cases or using technology for more complicated cases, and show/label key features of the graph. • Note from the Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.	• Analyze the difference between simple and complicated linear, quadratic, square root, cube root, and piecewise-defined functions, including step functions and absolute value functions and know when the use of technology is appropriate. • Compare and contrast the domain and range of absolute value, step and piece-wise defined functions with linear, quadratic, and exponential. • Select the appropriate type of function, taking into consideration the key features, domain, and range, to model a real-world situation.		
F.IF.8 a & b	• Identify how key features of a quadratic function relate to characteristics of in a real-world context. • Identify how key features of an exponential function relate to characteristics of in a real-world context.	• Given the expression of a quadratic function, interpret zeros, extreme values, and symmetry of the graph in terms of a real-world context. • Write a quadratic function defined by an expression in different but equivalent forms to reveal and explain different properties of the function and determine which form of the quadratic (i.e. expanded, perfect square form) is the most appropriate for showing zeros, extrema and symmetry of a graph in terms of a real-world context. • Note from Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate. • Given the expression of an exponential function, use the properties of exponents to interpret the expression in terms of a real-world context. • Write an exponential function defined by an expression in different but equivalent forms to reveal and explain different properties of the function, and determine which form of the function is the most appropriate for interpretation for a real-world context. • Note from Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.		
F.IF.9	• Identify types of functions based on verbal , numerical, algebraic, and graphical descriptions and state key properties (e.g. intercepts, maxima, minima, growth rates, average rates of change, and end behaviors) • Differentiate between different types of functions using a variety of descriptors (graphically, verbally, numerically, and algebraically) • Note from Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of	• Use a variety of function representations (algebraically, graphically, numerically in tables, or by verbal descriptions) to compare and contrast properties of two functions		

F.BF.1b	• Combine two functions using the operations of addition, subtraction, multiplication, and division • Evaluate the domain of the combined function. • Note from Appendix A*:* Develop models for more complex or sophisticated situations than in previous courses.	• Given a real-world situation or mathematical problem: • build standard functions to represent relevant relationships/ quantities • determine which arithmetic operation should be performed to build the appropriate combined function • relate the combined function to the context of the problem • Note from Appendix A*:* Develop models for more complex or sophisticated situations than in previous courses.		
F.BF.3	• Given a single transformation on a function (symbolic or graphic) identify the effect on the graph. • Using technology, identify effects of single transformations on graphs of functions. • Graph a given function by replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative). • Note from Appendix A: Use transformations of functions to find models as students consider increasingly more complex situations. Note the effect of multiple transformations on a single graph and the common effect of each transformation across function types.	• Describe the differences and similarities between a parent function and the transformed function. • Find the value of k, given the graphs of a parent function, f(x), and the transformed function: f(x) + k, k f(x), f(kx), or f(x + k). • Recognize even and odd functions from their graphs and from their equations. • Experiment with cases and illustrate an explanation of the effects on the graph using technology.		
N.CN.7	• Solve quadratic equations with real coefficients that have complex solutions. • Note from Appendix A: Limit to polynomials with real coefficients.			

16-18 weeks

- Polynomials (15)

CURRICULUM

ACT Quality Core

F. Exploring Polynomial Expressions, Equations and Functions

1. Expressions and Equations

a. Evaluate and simplify polynomial expressions and equations

b. Factor polynomials using a variety of methods (e.g., factor theorem, synthetic division, long division, sums and differences of cubes, grouping)

2. Functions

b. Determine the number and type of rational zeros for a polynomial function

c. Find all rational zeros of a polynomial function

d. Recognize the connection among zeros of a polynomial function, *x*-intercepts, factors of polynomials, and solutions of polynomial equations

a. Use technology to graph a polynomial function and approximate the zeros, minimum, and maximum; determine domain and range of the polynomial function

Common Core Standards

- N.CN.1 Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form a + b*i* with a and b real numbers.
- N.CN.2 Use the relation *i*2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
- N.CN.8 (+) Extend polynomial identities to the complex numbers.
- N.CN.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
- A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.*
- A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- A.APR.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
- A.APR.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- A.APR.4 Prove polynomial identities and use them to describe numerical relationships.
- A.APR.5 (+) Know and apply that the Binomial Theorem gives 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.
- F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
- F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*

POSSIBLE GAPS FROM ALG. 1: FACTORING POLYNOMIALS, RULES OF EXPONENTS

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
N.CN.1	• Define *i* as $\sqrt{-1}$ or *i*2 = -1. • Define complex numbers. • Write complex numbers in the form a + b*i* with			
N.CN.2	• Know that the commutative, associative, and distributive properties extend to the set of complex numbers over the operations of addition and multiplication. • Use the relation *i*2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.			

N.CN.8 (+)	• Explain that an identity shows a relationship between two quantities, or expressions, that is true for all values of the variables, over a specified set. • Give examples of polynomial identities. • Note from Appendix A: Limit to polynomials with real coefficients.	• Extend polynomial identities to the complex numbers. • Note from Appendix A: Limit to polynomials with real coefficients		
N.CN.9 (+)	• State, in written or verbal form, the Fundamental Theorem of Algebra. • Note from Appendix A: Limit to polynomials with real coefficients.	• Verify that the Fundamental Theorem of Algebra is true for second degree quadratic polynomials. • Note from Appendix A: Limit to polynomials with real coefficients.		
A.SSE.1a	• For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. • Note from Appendix A: extend to polynomial & rational expressions	• For expressions that represent a contextual quantity, interpret parts of an expression, such as terms, factors, and coefficients in terms of the context. • Note from Appendix A: extend to polynomial & rational expressions		
A.APR.1	• Identify that the sum, difference, or product of two polynomials will always be a polynomial, which means that polynomials are closed under the operations of addition, subtraction, and multiplication. • Define “closure”. • Apply arithmetic operations of addition, subtraction, and multiplication to polynomials. • Note from Appendix A: Algebra 2 should extend beyond the quadratic polynomials found in Algebra I.			
A.APR.2	• Define the remainder theorem for polynomial division and divide polynomials	• Given a polynomial p(x) and a number a, divide p(x) by (x – a) to find p(a) then apply the remainder theorem and conclude that p(x) is divisible by x – a if and only if p(a) = 0.		
A.APR.3	• When suitable factorizations are available, factor polynomials using any available methods. • Create a sign chart for a polynomial f(x) using the polynomial’s x-intercepts and testing the domain intervals for which f(x) greater than and less than zero. • Use the *x*-intercepts of a polynomial function and the sign chart to construct a rough graph of the function.			
A.APR.4	• Explain that an identity shows a relationship between two quantities, or expressions, that is true for all values of the variables, over a specified set.	• Prove polynomial identities. • Use polynomial identities to describe numerical relationships.		

A.APR.5 (+)	• Define the Binomial Theorem and compute combinations. • Apply the Binomial theorem to expand (x+y)n, when *n* is a positive integer and *x* and *y* are any number, rather than expanding by multiplying.	• Explain the connection between Pascal's Triangle and the determination of the coefficients in the expansion of (x+y)n, when *n* is a positive integer and *x* and *y* are any number.		
F.IF.4	• Define and recognize the key features in tables and graphs of linear, exponential, and quadratic functions: intercepts; intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, end behavior and periodicity. • Identify the type of function, given its table or graph. • Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context.	• Interpret key features of graphs and tables of functions in the terms of the contextual quantities the function represents. • Sketch graphs showing key features of a function that models a relationship between two quantities from a given verbal description of the relationship. • Notes from Appendix A: Emphasize the selection of a model function based on		
F.IF.7c	• Graph polynomial functions, by hand in simple cases or using technology for more complicated cases, and show/label maxima and minima of the graph, identify zeros when suitable factorizations are available, and show end behavior. • Notes from Appendix A: Relate F.IF.7c to the relationship between zeros of quadratic functions and their factored forms.	• Determine the difference between simple and complicated polynomial functions, and know when the use of technology is appropriate. • Relate the relationship between zeros of quadratic functions and their factored forms to the relationship between polynomial functions of degrees greater than two.		

19-21 weeks

- Rational & Radical Expressions & Equations (15)

CURRICULUM

ACT Quality Core

C. Establishing Number Sense and Operation Skills

1. Foundations

d. Simplify quotients of complex numbers

G. Exploring Advanced Functions

1. Rational and Radical Expressions, Equations and Functions

b. Solve mathematical and real-world rational equation problems (e.g., work or rate problems)
c. Simplify radicals that have various indices
d. Use properties of roots and rational exponents to evaluate and simplify expressions
e. Add, subtract, multiply, and divide expressions containing radicals
f. Rationalize denominators containing radicals and find the simplest common denominator
g. Evaluate expressions and solve equations containing *n*th roots or rational exponents
a. Evaluate and solve radical equations given a formula for a real-world situation

Common Core Standards

- 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 r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.
- 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.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- F.BF.4a Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2(x^3) or f(x) = (x+1)/(x-1) for x ≠ 1 (x not equal to 1).

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
A.APR.6	• Use inspection to rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$. • Use long division to rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$. • Use a computer algebra system to rewrite complicated rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials			
A.APR.7 (+)	• Add, subtract, multiply, and divide rational expressions.	• Informally verify that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression.		
A.REI.2	• Determine the domain of a rational function. • Determine the domain of a radical function. • Solve radical equations in one variable. • Solve rational equations in one variable.	• Give examples showing how extraneous solutions may arise when solving rational and radical equations.		

F.BF.4a	• Define inverse function. • Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. • Note from Appendix A: Extend the set of functions to simple rational, simple radical and simple exponential functions; connect F.BF.4a to F.LE.4.			

22-24 weeks

- Exponential & Logarithmic Functions (15)

CURRICULUM

ACT Quality Core

C. Establishing Number Sense and Operation Skills
1. Foundations
d. Simplify quotients of complex numbers
G. Exploring Advanced Functions
2. Exponential and Logarithmic Functions
a. Graph exponential and logarithmic functions with and without technology
a. Convert exponential equations to logarithmic form and logarithmic equations to exponential form

Common Core Standards

- F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
- F.LE.4 For exponential models, express as a logarithm the solution to ab^(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.*

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
F.IF.7e	• Graph exponential, logarithmic, and trigonometric functions, by hand in simple cases or using technology for more complicated cases, and show intercepts and end behavior for exponential and logarithmic functions, and for trigonometric functions, show period, midline, and amplitude. • Note from the Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.	• Analyze the difference between simple and complicated linear, quadratic, square root, cube root, piecewise-defined, exponential, logarithmic, and trigonometric functions, including step functions and absolute value functions and know when the use of technology is appropriate. • Compare and contrast the domain and range of exponential, logarithmic, and trigonometric functions with linear, quadratic, absolute value, step and piece-wise defined functions. • Select the appropriate type of function, taking into consideration the key features, domain, and range, to model a real-world situation.		
F.LE.4	• Missing from KDE document			

25-27 weeks

- Trigonometry (15)

CURRICULUM

ACT Quality Core

G. Exploring Advanced Functions

3. Trigonometric and Periodic Functions

b. Use the law of cosines and the law of sines to find the lengths of sides and measures of angles of triangles in mathematical and real-world problems
c. Use the unit-circle definition of the trigonometric functions and trigonometric relationships to find trigonometric values for general angles
d. Measure angles in standard position using degree or radian measure and convert a measure from one unit to the other
e. Graph the sine and cosine functions with and without technology
f. Determine the domain and range of the sine and cosine functions, given a graph
g. Find the period and amplitude of the sine and cosine functions, given a graph
h. Use sine, cosine, and tangent functions, including their domains and ranges, periodic nature, and graphs, to interpret and analyze relations

Common Core Standards

- F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- 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.
- F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*
- F.TF.8 Prove the Pythagorean identity (sin A)^2 + (cos A)^2 = 1 and use it to calculate trigonometric ratios.

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
F.TF.1	• Define a radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • Define terminal and initial side of an angle on the unit circle.			
F.TF.2	• Explain the relationship between a counterclockwise radian measure of an angle along the unit circle, terminal coordinate on the unit circle of that angle, and the associated real number. • Explain how radian measures of angles of the unit circle in the coordinate plane enable the extension of trigonometric functions to all real numbers.			
F.TF.5	• Define and recognize the amplitude, frequency, and midline parameters in a symbolic trigonometric function.	• Interpret the parameters of a trigonometric function (amplitude, frequency, and midline) in the context of real-world situations. • Explain why real-world or mathematical phenomena exhibits characteristics of periodicity. • Choose trigonometric functions to model periodic phenomena for which the amplitude,		

F.TF.8	• Define trigonometric ratios as related to the unit circle.	• Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ • Use the Pythagorean identity, $\sin^2(\theta) + \cos^2(\theta) = 1$, to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, and the quadrant of the angle.		

28-30 weeks

- Probability (15)

CURRICULUM

ACT Quality Core

H. Organizing and Analyzing Data and Applying Probability

1. Data, Relations, Probability, and Statistics

b. Use the fundamental counting principle to count the number of ways an event can happen

c. Use counting techniques, like combinations and permutations, to solve problems (e.g., to calculate probabilities)

d. Find the probability of mutually exclusive and non-mutually exclusive events

e. Find the probability of independent and dependent events

f. Use unions, intersections, and complements to find probabilities

g. Solve problems involving conditional probability

Common Core Standards (from Geometry)

- S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").*
- S.CP.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.*
- S.CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.*
- S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*
- S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*
- S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.*
- S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.*
- S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[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.5 (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*
- 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).*

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
S.CP.1	• Define unions, intersections and complements of events.	• Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or", "and", "not").		
S.CP.2	• Categorize events as independent or not using the characterization that two events *A* and *B* are independent when the probability of *A* and *B* occurring together is the product of their probabilities. • From Appendix A: Build on work from 2-way tables from Algebra 1 Unit 3 (S.ID.5) to develop understanding of conditional probability and independence.			

S.CP.3	• Know the conditional probability of A given B as P(A and B)/P(B). • Interpret independence of A and B as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.			
S.CP.4	• Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. • From Appendix A: Build on work with two-way tables from Algebra 1 Unit 3 (S.ID.5) to develop understanding of conditional probability and independence.	• Interpret two-way frequency tables of data when two categories are associated with each object being classified. (For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in 10th grade. Do the same for other subjects and compare the results.)		
S.CP.5	• Recognize the concepts of conditional probability and independence in everyday language and everyday situations.	• Explain the concepts of conditional probability and independence in everyday language and everyday situations. (For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.)		
S.CP.6	• Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A.	• Interpret the answer in terms of the model.		
S.CP.7	• Use the Additional Rule, P(A or B) = P(A) + P(B) – P(A and B)	• Interpret the answer in terms of the model.		
S.CP.8	• Use the multiplication rule with correct notation.	• Apply the general Multiplication Rule in a uniform probability model P(A and B) = P(A)P(B|A) = P(B)P(A|B). • Interpret the answer in terms of the model.		
S.CP.9	• Identify situations that are permutations and those that are combinations.	• Use permutations and combinations to compute probabilities of compound events and solve problems.		
S.MD.5 (+)	• Recognize the concepts of conditional probability and independence in everyday language and everyday situations.	• Explain the concepts of conditional probability and independence in everyday language and everyday situations.		
S.MD.6 (+)	• . Recall previous understandings of probability	• Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.) • From Appendix A: Extend to more complex probability models. Include situations such as those involving quality control, or diagnostic tests that yield both false positive and false negative results.		

S.MD.7 (+)	• Recall previous understandings of probability.	• Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). • From Appendix A: Extend to more complex probability models. Include situations such as those involving quality control, or diagnostic tests that yield both false positive and false negative results.		

31-33 weeks

- Data Analysis (15)

CURRICULUM

ACT Quality Core

H. Organizing and Analyzing Data and Applying Probability

1. Data, Relations, Probability, and Statistics

b. Use the fundamental counting principle to count the number of ways an event can happen
c. Use counting techniques, like combinations and permutations, to solve problems (e.g., to calculate probabilities)
d. Find the probability of mutually exclusive and non-mutually exclusive events
e. Find the probability of independent and dependent events
f. Use unions, intersections, and complements to find probabilities
g. Solve problems involving conditional probability

Common Core Standards

- S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*
- S.IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0. 5. Would a result of 5 tails in a row cause you to question the model?*
- S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*
- S.IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*
- S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*
- S.IC.6 Evaluate reports based on data.*
- S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

*Statistics and Probability is a Modeling Conceptual Category

Learning Targets from KDE Deconstructed Standards
I can…

	Knowledge	Reasoning	Performance	Product
S.IC.1	• Explain that statistics is a process for making inferences about population parameters, or characteristics. • Explain that statistical inferences about population characteristics are based on random samples from that population.			
S.IC.2	• Use various, specified data-generating processes/models (e.g. computer models, physical recreations of experiments, etc.) • Recognize data that various models produce. • Identify data or discrepancies that provide the basis for rejecting a statistical model.	• Decide if a specified model is consistent with results from a given data-generating process, eg., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model? • From Appendix A: For S.IC.2, include comparing theoretical and empirical results to evaluate the effectiveness of a treatment.		

S.IC.3	• Recognize the purpose of surveys, experiments, and observational studies in making statistical inferences and justifying conclusions and explain how randomization relates to each of these methods of data collection. • Recognize the differences among surveys, experiments, and observational studies in making statistical inferences and justifying conclusions explain how randomization	• Note from Appendix A: In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random		
S.IC.4	• Define margin of error • Explain the connection of margin of error to variation within a data set or population. • Use a simulation model to generate data for random sampling, assuming certain population parameters/ characteristics.	• Use data from a sample survey to estimate a population mean or proportion. • Interpret the data generated by a simulation model for random sampling in terms of the context the simulation models. • Develop a margin of error, assuming certain population parameters/ characteristics, through the use of simulation models for random sampling. • From Appendix A: Focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness.		
S.IC.5	• Using an established level of significance, determine if the difference between two parameters is significant.	• Use data from a randomized experiment to compare two treatments. • Choose appropriate method to simulate a randomized experiment. • Establish a reasonable level of significance. • From Appendix A: Focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness.		
S.IC.6	• Define the characteristics of experimental design (control, randomization, and replication).	• Evaluate the experimental study design, how the data was gathered, what analysis (numerical or graphical) was used (ex: use of randomization, control, replication). • Draw conclusions based on graphical and numerical summaries. • Support with graphical and numerical summaries how “appropriate” the report of data was (ex: consider the existence of outliers, correlation coefficient with both linear and non-linear data, margin of error).		

34-36 weeks
• Review/EOC Testing