KUTZTOWN AREA SCHOOL DISTRICT
Maximize potential, embrace change, create the future

Kutztown Area School District Curriculum (Unit Map)

Algebra II

Written by Sue Mixa

Course Description: Algebra II strengthens and broadens the concepts developed in Algebra I leading to improved problem solving skills. Course content includes linear & quadratic equations and inequalities, real and complex number systems, relations and functions, systems of equations, probability & statistics, powers, roots, exponential & logarithmic functions, and polynomials.

Table of Contents

Unit #/Title	1/Equations & Inequalities	Time Frame	1 Week

Standards

Standards of Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Look for and make use of structure.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
DD.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.

Big Ideas	Essential Questions
• Numbers and operations require an understanding of numbers and their relationships, operations and their meanings and the ability to compute fluently and with facility. • Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How can problem solving strategies be used to find verbal and algebraic models? • What are the steps for solving linear and absolute equations and inequalities? • When an expression involves more than one operation, in what order do you do the operations? (GEN Only)
Content	**Skills**
• Order of operations (General only) • Linear equations & inequalities in one variable • Linear models • Absolute value	• Simplify numerical and algebraic expressions. • Solve linear equations and inequalities. • Graph linear inequalities in one variable. • Rewrite formulas. • Use problem solving strategies and models. • Solve absolute value equations and inequalities.

Unit #/Title	2/Linear Equations & Functions	Time Frame	8-9 Weeks

Standards

Standards of Mathematical Practices

- Make sense of problems and persevere in solving them.
- Model with mathematics.
- Look for and express regularity in repeated reasoning.

.

CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
DD.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.

Big Ideas	Essential Questions
• Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually. • Mathematical processes require the use of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.	• How do I find the slope of a line and how do I use slope to determine if lines are parallel or perpendicular? • How do I graph and write a linear or absolute value equation or inequality? • How do I identify when a relation is a function?
Content	**Skills**
• Relations & functions • Slope & rate of change • Linear equations & inequalities in two variables • Scatterplots & best-fit lines • Absolute value functions	• Determine if a relation is a function. • Find slope. • Graph linear equations and inequalities in two variables. • Write equations of lines. • Model real-life situations with linear equations and inequalities. • Draw scatter plots and determine equations of best-fit lines. • Graph absolute value functions. • Model real-life situations with absolute value functions.

Unit #/Title	3/Linear Systems	Time Frame	3 Weeks

Standards

Standards of Mathematical Practices

- Make sense of problems and persevere in solving them.
- Model with mathematics.
- Look for and make use of structure.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Big Ideas	Essential Questions
• Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How do you find the solution to a system of linear inequalities? • How do you solve a system of linear equations in two variables algebraically? • How do you solve a system of linear equations in three variables algebraically? (Honors Only) • How do you solve a system of linear equations graphically?
Content	**Skills**
• Linear systems in two variables • Linear systems in three variables (Honors Only)	• Solve linear systems by graphing • Solve linear systems with the substitution method • Solve linear systems with the elimination method • Apply linear systems to real life situations. • Graph systems of linear inequalities

Unit #/Title	4/Quadratic Functions & Factoring	Time Frame	9 Weeks

Standards

Standards of Mathematical Practices

- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC..2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.

Big Ideas	Essential Questions
• Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually. • Mathematical processes require the use of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.	• How can we use different techniques to solve a quadratic equation? • How do changes in the coefficients or form of a quadratic function affect its graph? • How do you perform operations on complex numbers? • How do you write a quadratic function given different information?
Content	**Skills**
• Quadratic equations • Irrational roots • Complex numbers	• Simplify square roots. • Add, subtract, multiply, and divide complex numbers. • Solve quadratic equations with square roots, factoring, completing the square, and the quadratic formula. • Solve quadratic inequalities. (Honors Only) • Apply quadratic equations in real-life situations. • Graph quadratic equations and inequalities in vertex and standard form. • Write quadratic functions and models.

Unit #/Title	5/Probability & Statistics	Time Frame	4 Weeks

Standards

Standards of Mathematical Practices

- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.4.HS.B.4 Recognize and evaluate random processes underlying statistical experiments.
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.
CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.

Big Ideas	Essential Questions
• Data analysis requires choosing, collecting, organizing, displaying, interpreting, and analyzing data in order to understand, model, and solve problems. • Probability requires quantifying the likelihood that something will happen and enables one to make predictions and informed decisions.	• How do you determine the number of permutations or combinations of n objects? • How do you determine the probability that an event will occur? • How do you measure dispersion for a set of data? (Honors Only)
Content	**Skills**
• Fundamental counting principle • Permutations & combinations • Probability • Independent/dependent events	• Apply the Fundamental Counting Principle & permutations in real-life situations. • Use combinations in real-life situations. • Distinguish between when to use Fundamental Counting Principle, permutations, & combinations. • Define and use probability. • Find the probability of independent and dependent events.

Unit #/Title	6/Polynomials & Polynomial Functions	Time Frame	6 Weeks

Standards

Standards of Mathematical Practices

- Make sense of problems and persevere in solving them.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
CC.2.2.HS.D.5 Use polynomial identities to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
DD.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.

Big Ideas	Essential Questions
• Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How do you add, subtract, and multiply polynomials? • How do you graph, solve, and write a polynomial function? • How do you simplify algebraic expressions with exponents?
Content	**Skills**
• Properties of exponents • Polynomial functions • Remainder & factor theorems	• Use properties of exponents. • Evaluate and graph polynomial functions. • Add, subtract, and multiply polynomials. • Factor and solve polynomial equations. • Apply the Remainder & Factor Theorems. • Find rational zeros of polynomial functions.

Unit #/Title	7/Rational Exponents	Time Frame	1 Week

Standards

Standards of Mathematical Practices

- Reason abstractly and quantitatively.
- Look for and make use of structure.

CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
DD.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.

Big Ideas	Essential Questions
• Numbers and operations require an understanding of numbers and their relationships, operations and their meanings and the ability to compute fluently and with facility. • Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How do we evaluate rational exponents? • How do you graph and analyze functions involving rational exponents or radicals? • How do you solve equations that involve rational exponents or radicals?
Content	**Skills**
• *n*th Roots • Rational exponents • Function operations • Compositions of functions • Inverse functions	• Simplify expressions involving roots and rational exponents. • Graph functions involving rational exponents or radicals. • Perform operations on functions. • Find compositions of functions. • Find and apply inverse functions.

Unit #/Title	8/Exponential & Logarithmic Functions	Time Frame	2 Weeks

Standards

Standards of Mathematical Practices

- Reason abstractly and quantitatively.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

Big Ideas	Essential Questions
• Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How do you graph and solve exponential and logarithmic equations? • How do you write and apply exponential and power functions? (Power functions – Honors Only)
Content	**Skills**
• Exponential growth & decay • Natural base *e* • Logarithms & their properties • Exponential & logarithmic equations • Power functions (Honors Only)	• Graph exponential functions. • Write and solve exponential growth and decay equations that model real-life situations. • Apply the natural base, *e*, to real-life situations. • Evaluate and graph logarithmic functions. • Apply the properties of logarithms. • Solve exponential and logarithmic equations. • Write & apply exponential functions. • Write & apply power functions. (Honors Only)

Unit #/Title	9/Rational Functions	Time Frame	2 Weeks

Standards

Standards of Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Big Ideas	Essential Questions
• Numbers and operations require an understanding of numbers and their relationships, operations and their meanings and the ability to compute fluently and with facility. • Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually.	• How do you perform operations with rational expressions? • How do you solve rational equations?
Content	**Skills**
• Rational expressions	• Simplify and perform operations on rational expressions. • Solve equations involving rational expressions.