



Kutztown Area School District Curriculum (Unit Map)

Algebra I/Achievement Algebra 1

Written by Jesse Whitehouse, Susan Neumann, Aaron Ashman, & Sallie Sandler

Course Description: Real world problem solving is approached by seeking mathematical patterns that are generalized through the use of variables, properties, and symbolic notation to create algebraic expressions, formulas, and equations. Manipulation of these expressions, formulas, and equations is the core of Algebra I. Problem solving is approached through the creation and algebraic manipulation of equations. Graphs, diagrams, and other visual images will be used to provide concrete ways to conceptualize the abstract.

Table of Contents

<i>Unit #</i>	<i>Title</i>
<u>1</u>	<i>Solving Linear Equations</i>
<u>2</u>	<i>Graphing Linear Equations & Functions</i>
<u>3</u>	<i>Writing Linear Equations</i>
<u>4</u>	<i>Solving & Graphing Linear Inequalities</i>
<u>5</u>	<i>Probability and Data Analysis</i>
<u>6</u>	<i>Systems of Equations & Inequalities</i>
<u>7</u>	<i>Exponents & Exponential Functions</i>
<u>8</u>	<i>Polynomials and Factoring</i>
<u>9</u>	<i>Radicals and Geometry Connections</i>
<u>10</u>	<i>Achievement Algebra 1: Geometric Transformations, volume, Pythagorean Theorem</i>

Unit #/Title	1/Solving Linear Equations	Time Frame	3-4 Weeks
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Standards	
<p>Standards of Mathematical Practices</p> <ul style="list-style-type: none"> • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. <p>CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. 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 algebraically. CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations. 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.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations. CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • How can we use algebraic properties and processes to solve problems?
Content	Skills
<ul style="list-style-type: none"> • Variable • Algebraic expression • Evaluating an expression • Power • Base • Exponent • Order of operations • Verbal model • Equation • Inequality • Solution of an equation • Solution of an inequality • Rearranging formulas • Ratios and proportions • Percent • Functions • Distributive property 	<ul style="list-style-type: none"> • Evaluate powers • Evaluate an algebraic expression • Simplify by combining like terms • Solve an equation with a variable on one side • Solve an equation using the distributive property • Solve equations with variables on both sides • Rewrite linear equations • Apply the order of operations • Use a problem solving plan • Represent functions as rules, tables, and as graphs • Add, subtract, multiply, divide real numbers • Find square roots and compare real numbers • Write ratios and proportions • Solve percent problems • Rewrite equations and formulas

Unit #/Title	2/Graphing Linear Equations & Functions	Time Frame	4-5 Weeks
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Standards	
<p>Standards of Mathematical Practices</p> <ul style="list-style-type: none"> • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. <p>CC.2.2.HS.D.7 Create and graph equations to describe numbers or relationships. CC.2.2.HS.D.10 Represent, solve, and interpret equations 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.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations. CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations. CC.2.2.8.C.1 Define, evaluate, and compare functions. CC.2.2.8.C.2 Use concepts of functions to model relationships between quantities. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> • Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually. 	<ul style="list-style-type: none"> • How can we graph linear equations and functions using a variety of methods? • How can we recognize how changes in linear equations affect their graphs? • How can we use graphs of linear functions to solve real-world problems?
Content	Skills
<ul style="list-style-type: none"> • Linear equation • Standard form of a linear equation • Domain • Range • Function • X-intercept • Y-intercept • Slope • Rate of change • Slope-intercept form • Direct variation 	<ul style="list-style-type: none"> • Plot points on a coordinate plane • Graph a linear equation • Graph a linear equation using intercepts • Graph ordered pairs and linear equations in two variables (including vertical and horizontal lines) • Find slope and rate of change • Graph using slope-intercept form

Unit #/Title	3/Writing Linear Equations	Time Frame	4-5 Weeks
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Standards

Standards of Mathematical Practices

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

CC.2.2.HS.D.7 Create and graph equations 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 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 models to solve problems.

CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.

CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

CC.2.2.8.C.1 Define, evaluate, and compare functions.

CC.2.2.8.C.2 Use concepts of functions to model relationships between quantities.

CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.

CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.

Big Ideas	Essential Questions
<ul style="list-style-type: none"> • Algebraic concepts require representing, transitioning between, and manipulating situations numerically, symbolically, graphically, and contextually. • Data analysis requires choosing, collecting, organizing, displaying, interpreting, and analyzing data in order to understand, model, and solve problems. • Mathematical processes require the use of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas. 	<ul style="list-style-type: none"> • How can we write linear equations to solve real-world problems and model data with a line of fit?
Content	Skills
<ul style="list-style-type: none"> • Parallel • Perpendicular • Standard form • Slope-intercept form • Point-slope form • Scatter plot • Line of best fit • Correlation 	<ul style="list-style-type: none"> • Write a linear equation in slope-intercept form • Write linear equations in point-slope form • Write linear equations in standard form • Write equations of parallel and perpendicular lines • Fit a line to data • Make predictions with linear models <p>Achievement Algebra 1:</p>

<p>Achievement Algebra 1:</p> <ul style="list-style-type: none"> • Clusters, outliers • Linear association • Nonlinear association 	<ul style="list-style-type: none"> • Describe patterns such as clusters, outliers, positive or negative correlation, linear association, nonlinear association
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Unit #/Title	4/Solving & Graphing Linear Inequalities	Time Frame	5-6 Weeks
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Standards

<p>Standards of Mathematical Practices</p> <ul style="list-style-type: none"> • Model with mathematics • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. <p>CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.</p> <p>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</p> <p>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.</p> <p>CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.</p> <p>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.</p> <p>CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.</p>
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Big Ideas	Essential Questions
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • How can inequalities be used to quantify, solve, model and/or analyze mathematical situations? • How can solution sets be represented graphically?

Content	Skills
<ul style="list-style-type: none"> • Inequality • Compound inequality • Linear inequality • Absolute value 	<ul style="list-style-type: none"> • Write a linear inequality in slope-intercept form • Solve a linear inequality • Graph a linear inequality (on a number line/coordinate plane) • Interpreting solutions • Solve an absolute value equation/inequality

Unit #/Title	5/Probability and Data Analysis	Time Frame	3-4 Weeks
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Standards

Standards of Mathematical Practices

- 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

CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.

CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

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.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.

CC.2.4.8.B.1 Analyze and/or interpret bivariate data displayed in multiple representations.

CC.2.4.7.B.3 Investigate chance processes and develop, use, and evaluate probability models.

CC.2.4.HS.B.4 Recognize and evaluate random processes underlying statistical experiments.

Big Ideas	Essential Questions
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • How does the type of data influence the choice of display? • How can probability and data analysis be used to make predictions?

Content	Skills
<ul style="list-style-type: none"> • Sample space • Probability of an event • Odds • Compound event • Mutually exclusive events • Overlapping events • Mean • Median • Mode • Range • Stem-and-leaf plot • Frequency • Histogram • Box-and-whisker plot • Lower quartile • Upper quartile • Inner quartile range • Outlier <p>Achievement Algebra 1:</p> <ul style="list-style-type: none"> • Two-way Table 	<ul style="list-style-type: none"> • Calculate probability and odds • Analyze sets of data • Make and interpret data displays • Calculate measures of center/spread <p>Achievement Algebra 1:</p> <ul style="list-style-type: none"> • Construct and interpret two-way table • Use relative frequencies to describe possible associations between the two variables in a two-way table

<ul style="list-style-type: none"> Relative Frequency Association 	
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Unit #/Title	6/Systems of Equations & Inequalities	Time Frame	2-3 Weeks
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Standards

Standards of Mathematical Practices

- Model with mathematics.
- Use appropriate tools strategically.
- Make sense of problems and persevere in solving them.

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.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.

CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.

Big Ideas	Essential Questions
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> How can we solve a linear system for two unknown values? How can we choose an appropriate method when solving a linear system? How can we solve a system of linear inequalities and interpret its solution?

Content	Skills
<ul style="list-style-type: none"> System of linear equations Consistent independent system Inconsistent system Consistent dependent system System of inequalities Solution of a system of equations/inequalities 	<ul style="list-style-type: none"> Solve linear systems by graphing, substitution, and elimination Solve linear inequalities by graphing Students will be able to determine whether there is one, none, or infinitely many solutions to a linear system

Unit #/Title	7/Exponents & Exponential Functions	Time Frame	2-3 Weeks
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Standards	
<p>Standards of Mathematical Practices</p> <ul style="list-style-type: none"> Reason abstractly and quantitatively. Look for and make use of structure. Look for and express regularity in repeated reasoning. <p>CC.2.2.8.B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions. CC.2.1.8.E.1 Distinguish between rational and irrational numbers using their properties. CC.2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers. 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.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> How can exponent expressions be manipulated and simplified? How do exponent rules apply to scientific notation?
Content	Skills
<ul style="list-style-type: none"> Base Exponents and their properties Scientific notation Operations involving exponents 	<ul style="list-style-type: none"> Simplify expressions involving exponents Represent larger and smaller numbers using scientific notation

Unit #/Title	8/Polynomials and Factoring	Time Frame	3-4 Weeks
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Standards	
<p>Standards of Mathematical Practices</p> <ul style="list-style-type: none"> • Model with mathematics. • Use appropriate tools strategically. • Look for and make use of structure. <p>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</p> <p>CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.</p> <p>CC.2.2.HS.D.5 Use polynomial identities to solve problems.</p> <p>CC.2.1.6.E.3 Develop and/or apply number theory concepts to find common factors and multiples.</p> <p>CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.</p> <p>CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.</p> <p>CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • What are ways we can add, subtract, and multiply polynomials? • How can I factor polynomials? • How do we write and solve polynomial equations in the real-world?
Content	Skills
<ul style="list-style-type: none"> • monomial • degree • polynomial • leading coefficient • binomial • trinomial • roots • vertical motion model • perfect square trinomial • factor by grouping • factor completely 	<ul style="list-style-type: none"> • Factor (leading coefficient as a real number, grouping) • Add polynomials with different degrees • Subtract polynomials with different degrees • Multiply polynomials with different degrees • Apply the FOIL method • Solve polynomial equations

Unit #/Title	9/Radicals and Geometry Connections	Time Frame	1 Week
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Standards	
<p>Standards of Mathematical Practice</p> <ul style="list-style-type: none"> Reason abstractly and quantitatively. Attend to precision. <p>CC.2.2.8.B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions. CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems. CC.2.1.8.E.1 Distinguish between rational and irrational numbers using their properties. CC.2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> How can we use properties of radicals in expressions and equations?
Content	Skills
<ul style="list-style-type: none"> radical expression simplest form of a radical expression square root <p>Achievement Algebra 1:</p> <ul style="list-style-type: none"> Terminating decimal Repeating decimal 	<ul style="list-style-type: none"> simplifying radical expressions <p>Achievement Algebra 1:</p> <ul style="list-style-type: none"> Convert a terminating or repeating decimal to a rational number Estimate the value of an irrational number without a calculator

Unit # / Title	10/Geometric Transformations, Volume & Pythagorean Theorem (Achievement Alg. 1)	Time Frame	2 weeks
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Standards	
<p>Standards of Mathematical Practice</p> <ul style="list-style-type: none"> • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning. <p>CC.2.3.8.A.1 Apply the concepts of volume of cylinders, cones, and spheres to solve real- world and mathematical problems.</p> <p>CC.2.3.8.A.2 Understand and apply congruence, similarity, and geometric transformations using various tools.</p> <p>CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> • Geometry requires the analysis of characteristics and properties of two- and three-dimensional shapes, describing spatial relationships, and using geometric models to solve problems. • Measurement requires an understanding of measurable attributes and applying appropriate techniques, tools, units, and formulas to quantify them. 	<ul style="list-style-type: none"> • How are spatial relationships, including shape and dimension, used to draw, construct, model, and represent real situations or solve problems? • How can the application of the attributes of geometric shapes support mathematical reasoning and problem solving? • How can geometric properties and theorems be used to describe, model, and analyze situations? • Why does “what” we measure influence “how” we measure? • In what ways are the mathematical attributes of objects or processes measured, calculated, and/or interpreted?
Content	Skills
<ul style="list-style-type: none"> • Transformations: reflect, translate, rotate, dilate. • Similarity of geometric figures • Pythagorean Theorem • Converse of Pythagorean Theorem • Congruent sides, angles • Corresponding Parts • Similar polygons • Volume 	<ul style="list-style-type: none"> • Reflect rigid geometric figures across the x-axis and the y-axis. • Translate rigid geometric figures. • Rotate rigid geometric figures about the origin. • Identify similar polygons and triangles. • Use proportions to solve indirect measurement problems and unknown lengths of similar triangles. • Dilate a polygon given a scale factor • Graph a polygon and the image. • Use the converse of the Pythagorean theorem to find out if a triangle is a right triangle. • Use the Pythagorean theorem to find and unknown side length in a right triangle.

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| | <ul style="list-style-type: none">• Use the Pythagorean theorem to find the distance between two points in a coordinate plane.• Calculate the volume of a cylinder, cone and sphere. |
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