

Unit 1: Solving Linear Equations

Course Time Prior to Keystone/PSSA:

- Periods – 18
- Blocks – 8

Overview: Students will be able to:

- Model, write, and solve linear equations using inverse operations, combining like terms, and using the distributive property.
- Solve problems using proportions and percents.

Unit Essential Questions:

- How do you write, solve, graph, and interpret linear equations to model relationships between quantities?
- How do we recognize when it is appropriate to use a linear model to represent a real-world situation?
- What are the benefits of using a linear model to answer questions about the situation?

Keystone Content Module/Assessment Anchor:

- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents.)
- **A1.1.2.1** Write, solve, and/or graph linear equations using various methods.

Keystone Eligible Content:

- **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations).
- **A1.1.2.1.2** Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
- **A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.

Pennsylvania Common Core Standard(s):

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

National Common Core Standard(s):

Create equations that describe numbers or relationships

- **CC.9-12.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.*

- **CC.9-12.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 .*

Understand solving equations as a process of reasoning and explain the reasoning

- **CC.9-12.A.REI.1** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Solve equations and inequalities in one variable

- **CC.9-12.A.REI.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Interpret the structure of expressions

- **CC.9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.
 - a. Interpret parts of an expression, such as terms, factors, and coefficients.
 - b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P .

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CC.9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CC.9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

ISTE Standards:

1. Creativity and Innovation – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
 - b. Create original works as a means of personal or group expression
 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
 - a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
 - b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
 - d. Contribute to project teams to produce original works or solve problems
3. Research and Information Fluency – Students apply digital tools to gather, evaluate, and use information.
 - a. Plan strategies to guide inquiry
 - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
 - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
 - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making – Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
 - a. Identify and define authentic problems and significant questions for investigation
 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions

5. Digital Citizenship – Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
 - c. Demonstrate personal responsibility for lifelong learning
 - d. Exhibit leadership for digital citizenship
6. Technology Operations and Concepts – Students demonstrate a sound understanding of technology concepts, systems, and operations.
 - a. Understand and use technology systems
 - b. Select and use applications effectively and productively

Career Education and Work Standards:

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.
- 13.1.11.E Justify the selection of a career.
- 13.1.11.H Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.

Connecting to Common Core and Other Standards:

- PA Standards found at www.pdesas.org/standards/standardsdownloads
- National Common Core found at www.corestandards.org
- ISTE found at www.iste.org/standards/nets-for-students.aspx
- Career Education and Work found at www.pacareerstandards.com/
- See Appendix for complete documents.

ELL Differentiation:

- Math & LA specifics found at www.pde.sas.org/module/sas/curriculumframework/elloverlay.aspx
- Generic found at <http://www.easad.net/esl>
- TODOS Resources www.todos-math.org

Enrichment:

- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

- Use order of operations to simplify and evaluate expressions and formulas
- Classify and compare real numbers
- Operations with rational numbers

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- Properties of real numbers
- Operations with real numbers

IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.1 A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3	<ul style="list-style-type: none"> • Represent and/or use numbers in equivalent forms • Write, solve, and/or graph linear equations using various methods: <ul style="list-style-type: none"> ○ One-step Equations ○ Two-step Equations ○ Multi-step Equations ○ Equations with Like Terms ○ Distributive Property ○ Equations with Variables on Both Sides ○ Proportions ○ Percent Equations ○ Formulas ○ Rational 	<ul style="list-style-type: none"> • Translate verbal sentences into equations or inequalities • Solve one- and two-step equations • Solve real-world problems • Solve multi-step equations • Solve equations by combining like terms • Use the Distributive Property to solve equations • Solve equations with variable on both sides • Solve equations involving rational numbers • Use equations to solve percent problem • Solve a formula • Create equations for real-life situations • Write a ratio • Write and/or solve a proportion • Apply proportions to similar figures • Use the cross products property • Use the scale on a map • Find a percent using a proportion • Find a percent using the percent equation • Find a base or a part of a base 	<ul style="list-style-type: none"> • Algebraic Expression • Linear • Linear Equations • Equations • Like Terms • Coefficient • Combine • Cross Product • Distribute • Distributive Property • Percent • Proportion • Ratio • Rational Numbers • Irrational Numbers • Solve • Solution • Formula • Open Sentence • Variable • Ratio • Proportion • Cross Product • Scale Drawing 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

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	Equations ○ Literal Equations	using the percent equation • Find a percent of change • Use and solve formulas • Solve real world problems	• Scale Model • Scale • Literal Equation • Similar (Figures)	page • YouTube • ESASD Valuable Video Library	
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Unit 2: Solving and Graphing Linear Inequalities

Course Time Prior to Keystone/PSSA:

- Periods – 15
- Blocks – 6

Overview: Students will be able to:

- Read, write, graph, and solve inequalities and compound inequalities and interpret the solutions.
- Read, write, graph, and solve absolute value equations and inequalities, and interpret the solutions.

Unit Essential Questions:

- How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities?
- How does graphing promote conceptual understanding of topics in number theory and/or algebra?
- How are mathematical notations used as part of the problem-solving process?

Keystone Content Module/Assessment Anchor:

- **A1.1.3.1** Write, solve, and/or graph linear inequalities using various methods.

Keystone Eligible Content:

- **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
- **A1.1.3.1.2** Identify or graph the solution set to a linear inequality on a number line.
- **A1.1.3.1.3** Interpret solutions to problems in the context of the problem situation. Note: Limit to linear inequalities.

Pennsylvania Common Core Standard(s):

- **CC.2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **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.

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Create equations that describe numbers or relationship

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Solve equations and inequalities in one variable

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Reason quantitatively and use units to solve problems

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 - d. Contribute to project teams to produce original works or solve problems
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 - a. Plan strategies to guide inquiry
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ELL Differentiation:

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- TODOS Resources www.todos-math.org

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Remediation:

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- Properties of real numbers.
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IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

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A1.1.3.1.1 A1.1.3.1.2 A1.1.3.1.3	<ul style="list-style-type: none"> • Write, solve, and/or graph linear inequalities using various methods. • Inequalities and the Number Line • One-step Inequalities • Two-step inequalities • Multi-step Inequalities • Compound Inequalities • Solutions and their Interpretations • Absolute Value Equations and Inequalities 	<ul style="list-style-type: none"> • Use and apply the properties of inequalities • Identify solutions to inequalities using mental math • Identify or graph the solution set to a linear inequality on a number line • Graph and write inequalities • Write inequalities from their graphs • Use addition and subtraction to solve inequalities • Use multiplication and division to solve inequalities • Solve multi-step inequalities • Write, solve and graph compound inequalities containing 'and' and 'or' • Solve equations and inequalities that involve absolute value • Interpret solutions to problems in the context of the problem situation • Interpret a solution that indicates infinite solutions or possibilities. • Use and apply inequality symbols appropriately ($<$, \leq, $>$, \geq) in problems and graphically • Solve real-world problems involving inequalities 	<ul style="list-style-type: none"> • Absolute Value • Absolute Value Equation • Absolute Value Inequality • Compound Inequality • Graph of an Inequality • Inequality • Solution • Solution Set • Greater Than • Less Than • Greater Than or Equal To • Less Than or Equal To • Equivalent Inequalities • Properties of Inequality 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • Algebra 1, Concepts and Skills, (McDougal Littell, 2004) • Algebra 1, (McDougal Littell, 2007) • Algebra 1, Prentice Hall, 2007 • Common Core Algebra 1, (Pearson 2012) • OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010) • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page • YouTube • ESASD Valuable Video Library 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

Unit 3: Linear Equations, Functions, and Inequalities in Two Variables

Course Time Prior to Keystone/PSSA:

- Periods – 35
- Blocks – 16

Overview: Students will be able to:

- Analyze data; graph tables and events.
- Identify, write, and graph functions and relations.
- Determine rate of change and slope.
- Find direct variation.
- Use slope-intercept, standard, and point-slope forms to write and graph linear equations and functions.
- Graph linear inequalities in two variables
- Identify and graph parallel and perpendicular lines.

Unit Essential Questions:

- How do you write and graph linear functions and equations using multiple methods?
- How do changes in linear equations affect their graphs?
- How can you use a linear model to solve problems?
- How do you model data with a line of best fit?

Keystone Content Module/Assessment Anchor:

- **A1.1.2.1** Write, solve, and/or graph linear equations using various methods.
- **A1.1.3.1** Write, solve, and/or graph linear inequalities using various methods.
- **A1.2.1.1** Analyze and/or use patterns or relations.
- **A1.2.1.2** Interpret and/or use linear functions and their equations, graphs, or tables.
- **A1.2.2.1** Describe, compute, and/or use the rate of change (slope) of a line.

Keystone Eligible Content:

- **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations).
- **A1.1.2.1.2** Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
- **A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
- **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
- **A1.1.3.1.3** Interpret solutions to problems in the context of the problem situation. Note: Limit to linear inequalities
- **A1.2.1.1.1** Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
- **A1.2.1.1.2** Determine whether a relation is a function, given a set of points or a graph.
- **A1.2.1.1.3** Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).
- **A1.2.1.2.1** Create, interpret, and/or use the equation, graph, or table of a linear function.
- **A1.2.1.2.2** Translate from one representation of a linear function to another (i.e., graph, table, and equation).

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- **A1.2.2.1.1** Identify, describe, and/or use constant rate of change.
- **A1.2.2.1.2** Apply the concept of linear rate of change (slope) to solve problems.
- **A1.2.2.1.3** Write or identify a linear equation when given:
 - The graph of the line
 - Two points on the line, or
 - The slope and point on a line(Linear equation may be in point-slope, standard, and/or slope intercept form.)
- **A1.2.2.1.4** Determine the slope and/or y-intercept represented by a linear equation or graph.

Pennsylvania Common Core Standard(s):

- **2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **2.2.HS.C.5** Construct and compare linear, quadratic and/or exponential models to solve problems.
- **2.2.HS.C.6** Interpret functions in terms of the situation they model.
- **2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.
- **2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.
- **2.2.HS.D.10** Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- **2.2.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays.
- **2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **2.2.8.B.2** Understand the connections between proportional relationships, lines, and linear equations.
- **2.2.8.B.3** Analyze and solve linear equations and pairs of simultaneous linear equations.
- **2.2.8.C.1** Define, evaluate, and compare functions.
- **2.2.8.C.2** Use concepts of functions to model relationships between quantities.
- **2.1.HS.F.4** Use units as a way to understand problems and to guide the solution of multi-step problems.
- **2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **2.4.HS.B.3** Analyze linear models to make interpretations based on the data.

National Common Core Standard(s):

Create equations that describe numbers or relationship

- **CC.9-12.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.*
- **CC.9-12.A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **CC.9-12.A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

Solve equations and inequalities in one variable

- **CC.9-12.A.REI.3** Solve linear equation and inequalities in one variable, including equations with coefficients represented by letters.

Represent and solve equations and inequalities graphically

- **CC.9-12.A.REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- **CC.9-12.A.REI.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Build a function that models a relationship between two quantities

- **CC.9-12.F.BF.1** Write a function that describes a relationship between two quantities.
 - a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

Understand the concept of a function and use function notation

- **CC.9-12.F.IF.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
- **CC.9-12.F.IF.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- Interpret functions that arise in applications in terms of the context.
- **CC.9-12.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.
- **CC.9-12.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.
- **CC.9-12.F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations

- **CC.9-12.F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
 - a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
 - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
 - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- **CC.9-12.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.*

Construct and compare linear, quadratic, and exponential models and solve problems

- **CC.9-12.F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

Build new functions from existing functions

- **CC.9-12.F.BF.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CC.9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CC.9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Interpret linear models

- **CC.9-12.S-ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Use coordinates to prove simple geometric theorems algebraically

- **CC.9-12.G-GPE.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

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 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
 - a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
 - b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
 - d. Contribute to project teams to produce original works or solve problems
3. Research and Information Fluency – Students apply digital tools to gather, evaluate, and use information.
 - a. Plan strategies to guide inquiry
 - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
 - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
 - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making – Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
 - a. Identify and define authentic problems and significant questions for investigation
 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions
5. Digital Citizenship – Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
 - c. Demonstrate personal responsibility for lifelong learning
 - d. Exhibit leadership for digital citizenship
6. Technology Operations and Concepts – Students demonstrate a sound understanding of technology concepts, systems, and operations.
 - a. Understand and use technology systems
 - b. Select and use applications effectively and productively

Career Education and Work Standards:

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.
- 13.1.11.E Justify the selection of a career.
- 13.1.11.H Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.

Connecting to Common Core and Other Standards:

- PA Standards found at www.pdesas.org/standards/standardsdownloads
- National Common Core found at www.corestandards.org
- ISTE found at www.iste.org/standards/nets-for-students.aspx
- Career Education and Work found at www.pacareerstandards.com/
- *See Appendix for complete documents.

ELL Differentiation:

- Math & LA specifics found at www.pde.sas.org/module/sas/curriculumframework/elloverlay.aspx
- Generic found at <http://www.easad.net/esl>
- TODOS Resources www.todos-math.org

Enrichment:

- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

- Solve linear equations
- Operations with rational numbers
- Plotting points on the coordinate plane
- Operations with real numbers Internet
- Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>

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- <http://www.classzone.com/cz/login.htm>

IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

East Stroudsburg Area School District
Keystone Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3 A1.1.3.1.1 A1.1.3.1.3 A1.2.1.1.1 A1.2.1.1.2 A1.2.1.1.3 A1.2.1.2.1 A1.2.1.2.2 A1.2.2.1.1 A1.2.2.1.2 A1.2.2.1.3 A1.2.2.1.4	<ul style="list-style-type: none"> • Write, solve, and/or graph linear equations using various methods. • Write, solve, and/or graph linear inequalities using various methods. • Analyze a set of data for the existence of a pattern and represent the pattern algebraically or graphically. • Analyze and/or use patterns or relations. • Describe, compute, and/or use the rate of change (slope) of a line. 	<ul style="list-style-type: none"> • Graph/plot and/or name ordered pairs in a coordinate plane • Graph a function • Identify relations and functions • Evaluate functions • Determine whether a relation is a function given a set of points or a graph • Model functions using rules, tables, and graphs, and translate from one representation to another • Write a function rule given a table or a real world situation • Identify domain and range of a function • Create, interpret, and/or use the equation, graph, or table of a linear function • Graph horizontal and vertical lines • Graph a linear function over a specified domain • Identify discrete and continuous functions • Find the intercepts of the graph of an equation • Use intercepts to graph an equation • Find the slope of a line from its graph • Find and/or identify positive, negative, zero, and undefined slopes 	<ul style="list-style-type: none"> • Constant of Variation • Direct Variation • Domain • Function • Function Notation • Discrete Function • Continuous Function • Linear Function • Line of Best Fit • Parallel Lines • Perpendicular Line • Point-Slope Form • Quadrant • Range • Rate of Change • Relation • Scatter Plot • Slope • Slope-Intercept Form • Standard Form • Vertical Line Test • x-intercept • y-intercept • Family of Functions • Parent Linear Function • Inequality • Absolute Value 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningdyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningdyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • Algebra 1, Concepts and Skills, (McDougal Littell, 2004) • Algebra 1, (McDougal Littell, 2007) • Algebra 1, Prentice Hall, 2007 • Common Core Algebra 1, (Pearson 2012) • OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010) • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page • YouTube • ESASD Valuable Video Library 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3 A1.1.3.1.1 A1.1.3.1.3 A1.2.1.1.1 A1.2.1.1.2 A1.2.1.1.3 A1.2.1.2.1 A1.2.1.2.2 A1.2.2.1.1 A1.2.2.1.2 A1.2.2.1.3 A1.2.2.1.4	<ul style="list-style-type: none"> • Write, solve, and/or graph linear equations using various methods. • Write, solve, and/or graph linear inequalities using various methods. • Analyze a set of data for the existence of a pattern and represent the pattern algebraically or graphically. • Analyze and/or use patterns or relations. • Describe, compute, and/or use the rate of change (slope) of a line. 	<ul style="list-style-type: none"> • Solve and interpret problems and their solutions relating slope to rate of change • Identify, describe, and/or use constant rate of change • Apply the concept of slope and/or rate of change to solve problems • Identify slope and y-intercept and write the equation of the line • Write and/or identify a linear equation from the graph • Write the equation and/or graph the line when given the slope and a point on the line • Graph an equation using slope-intercept form • Change slope and y-intercepts of lines relating to real-world problems • Identify parallel lines • Identify, graph, and write direct variation equations • Use function notation to find x-values and graph a function • Compare graphs of linear functions with the graph $f(x) = x$ • Write an equation of a line when given two points • Write and/or graph an equation in point-slope form • Use point-slope form to write an equation 	<ul style="list-style-type: none"> • Constant of Variation • Direct Variation • Domain • Function • Continuous Function • Function Notation • Line of Best Fit • Linear Function • Parallel Lines • Perpendicular Line • Point-Slope Form • Quadrant • Range • Rate of Change • Relation • Scatter Plot • Slope • Slope-Intercept Form • Standard Form • Vertical Line Test • x-intercept • y-intercept • Family of Functions • Parent Linear Function • Converse • Inequality • Absolute Value 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page • YouTube • ESASD Valuable Video 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

		<ul style="list-style-type: none"> • Write equivalent equations in standard form 		Library	
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Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3 A1.1.3.1.1 A1.1.3.1.3 A1.2.1.1.1 A1.2.1.1.2 A1.2.1.1.3 A1.2.1.2.1 A1.2.1.2.2 A1.2.2.1.1 A1.2.2.1.2 A1.2.2.1.3 A1.2.2.1.4	<ul style="list-style-type: none"> • Write, solve, and/or graph linear equations using various methods. • Write, solve, and/or graph linear inequalities using various methods. • Analyze a set of data for the existence of a pattern and represent the pattern algebraically or graphically. • Analyze and/or use patterns or relations. • Describe, compute, and/or use the rate of change (slope) of a line. 	<ul style="list-style-type: none"> • Determine the slope and/or y-intercept represented by a linear equation or its graph • Write an equation for a graph in standard form • Write an equation of a parallel line • Determine whether lines are parallel or perpendicular • Write an equation of a perpendicular line • Solve equations and inequalities that involve absolute value • Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays • Use units as a way to understand problems and to guide the solution of multi-step problems • Interpret solutions to problems in the context of the situation • Graph a linear inequality in two variables • Graph a linear inequality in one variable in the coordinate plane 	<ul style="list-style-type: none"> • Constant of Variation • Direct Variation • Domain • Function • Continuous Function • Function Notation • Line of Best Fit • Linear Function • Parallel Lines • Perpendicular Line • Point-Slope Form • Quadrant • Range • Rate of Change • Relation • Scatter Plot • Slope • Slope-Intercept Form • Standard Form • Vertical Line Test • x-intercept • y-intercept • Family of Functions • Parent Linear Function • Converse • Inequality 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • Algebra 1, Concepts and Skills, (McDougal Littell, 2004) • Algebra 1, (McDougal Littell, 2007) • Algebra 1, Prentice Hall, 2007 • Common Core Algebra 1, (Pearson 2012) • OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010) • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

			<ul style="list-style-type: none">• Absolute Value	<ul style="list-style-type: none">• YouTube• ESASD Valuable Video Library	
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Unit 4: Solve and Graph Systems of Linear Equations and Inequalities

Course Time Prior to Keystone/PSSA:

- Periods – 16
- Blocks – 7

Overview: Students will be able to:

- Apply graphing techniques for linear functions and extend the concept to systems of linear equations and inequalities.
- Apply solving techniques; graphing, substitution, and elimination (with emphasis placed on the solution of a system being the intersection of two lines or planar regions).
- Determine whether a system has one solution, no solutions, or infinitely many solutions.

Unit Essential Questions:

- How can we show that algebraic properties and processes are extensions of arithmetic properties and processes and how can we use algebraic properties and processes to solve problems?
- How would you describe the relationship between quantities that are represented by linear equations and/or inequalities?
- How would you use graphical and/or algebraic techniques to solve a system of equations and how would you interpret the solutions of that system?

Keystone Content Module/Assessment Anchor:

- **A1.1.2** Linear Equations
- **A1.1.2.1** Write, solve, and/or graph linear equations using various methods.
- **A1.1.2.2** Write, solve, and/or graph systems of linear equations using various methods.
- **A1.1.3** Linear Inequalities
- **A1.1.3.1** Write, solve, and/or graph linear inequalities using various methods.
- **A1.1.3.2** Write, solve, and/or graph systems of linear inequalities using various methods.

Keystone Eligible Content:

- **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations).
- **A1.1.2.1.2** Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
- **A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
- **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.
- **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.
- **A1.1.3.1.3** Interpret solutions to problems in the context of the problem situation. (Note: Limit to linear inequalities.)
- **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. (Note: Limit systems to two linear inequalities.)
- **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation. (Note: Limit systems to linear inequalities.)

Pennsylvania Common Core Standard(s):

- **CC.2.2.8.B.3** Analyze and solve linear equations and pairs of simultaneous linear equations.
- **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.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **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.3** Write functions or sequences that model relationships between two quantities.

National Common Core Standard(s):

Create equations that describe numbers or relationship

- **CC.9-12.A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **CC.9-12.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.*

Solve systems of equations

- **CC.9-12.A.REI.5** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- **CC.9-12.A.REI.6** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- **CC.9-12.A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.*
- Represent and solve equations and inequalities graphically.
- **CC.9-12.A.REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- **CC.9-12.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.
- **CC.9-12.A.REI.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CC.9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.

- **CC.9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

ISTE Standards:

1. Creativity and Innovation – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
 - b. Create original works as a means of personal or group expression
 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
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 - b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
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 - d. Process data and report results
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 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions
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 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
 - c. Demonstrate personal responsibility for lifelong learning
 - d. Exhibit leadership for digital citizenship
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 - b. Select and use applications effectively and productively

Career Education and Work Standards:

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- *See Appendix for complete documents.

ELL Differentiation:

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- Generic found at <http://www.easad.net/esl>
- TODOS Resources www.todos-math.org

Enrichment:

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 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

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- Operations with rational numbers
- Plotting points on the coordinate plane
- Operations with real numbers Internet
- Research Activities
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 - <http://www.classzone.com/cz/login.htm>

IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

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Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
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East Stroudsburg Area School District
Keystone Algebra 1

		many solutions	Equations • System of Linear Inequalities • Boundary	<ul style="list-style-type: none"> • YouTube • ESASD Valuable Video Library 	
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Keystone Anchors & Eligible Content	Unit Concepts What students need to know:	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.3.1.1 A1.1.3.1.2 A1.1.3.1.3 A1.1.3.2.1 A1.1.3.2.2	<ul style="list-style-type: none"> • Write and/or solve a system of linear inequalities using graphing. (Note: Limit systems to two linear inequalities.) • Interpret solutions to problems in the context of the problem situation. (Note: Limit systems to linear inequalities.) 	<ul style="list-style-type: none"> • Solve inequalities and systems of inequalities and interpret solutions to problems in the context of the problem situation • Use inequality symbols correctly in solving and/or writing problems <ul style="list-style-type: none"> ○ $>$: Greater Than ○ \geq : Greater Than or Equal To ○ $<$: Less Than ○ \leq : Less Than or Equal To • Read and interpret solid and dashed lines on the Cartesian Plane • Identify boundaries for a system of inequalities • Identify bounded and unbounded solutions, as well as systems of inequalities with no solutions • Use and apply solid and dashed lines to represent the bounded regions for a system of inequalities • Write inequalities to represent linear models in 	<ul style="list-style-type: none"> • Solution • Solution Set • Variable • Inverse Operations • Inequality • Compound Inequality • Graph • Graphing • Cartesian Plane • Absolute Value • Substitution • Substitution Method • Elimination • Elimination Method • Scalar • Scalar Multiple • Parallel • Perpendicular • Transversal • Quadrant • x-intercept • y-intercept • Slope • Infinite • Infinity • Coincident Lines • Null Set 	<ul style="list-style-type: none"> • www.classzone.com • www.phschool.com • www.StudyIsland.com • www.USATestPrep.com • https://www.thelearningodysey.com/ • http://www.khanacademy.org/ • www.ck12.org • http://www.hippocampus.org/ • Algebra 1, Concepts and Skills, (McDougal Littell, 2004) • Algebra 1, (McDougal Littell, 2007) • Algebra 1, Prentice Hall, 2007) • OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010) • McDougal Littell & Prentice Hall teaching resources • Calculators • CPS Clickers • YouTube • ESASD Valuable Video Library • New & updated resources available on departmental pages 	<ul style="list-style-type: none"> • Teacher generated tests and quizzes • Classroom Diagnostic Tool (CDT) • Compass Learning • Study Island • USA Test Prep • Observation • Homework • Class Work • Projects • Bell Ringers

East Stroudsburg Area School District
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		<p>real-world situations</p> <ul style="list-style-type: none">• Write systems of equations and inequalities to represent real-world situations	<ul style="list-style-type: none">• Empty Set• System of Inequalities• Boundary• Bounded Region		
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Unit 5: Exponents and Exponential Functions

Course Time Prior to Keystone/PSSA:

- Periods – 16
- Blocks – 7

Overview: Students will be able to:

- Distinguish between, order, and compare rational and irrational numbers.
- Develop an understanding of exponents and radicals and apply these concepts to questions of equivalent forms of numbers.
- Use the properties of exponents.
- Differentiate between rational and irrational numbers, and use/understand scientific notation.

Unit Essential Questions:

- How does understanding of equivalent forms of numbers help to differentiate between rational and irrational numbers?
- How can we determine if a real-world situation should be represented by a quadratic or exponential function?

Keystone Content Module/Assessment Anchor:

- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- **A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems.
- **A1.1.1.4** Use estimation strategies in problem-solving situations.

Keystone Eligible Content:

- **A1.1.1.1.1** Compare and/or order any real numbers. Note: Rational and irrational may be mixed.
- **A1.1.1.1.2** Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$).
- **A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from -10 to 10.
- **A1.1.1.4.1** Use estimation to solve problems.

Pennsylvania Common Core Standard(s):

- **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.2.1.8.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.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.
- **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.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **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/or exponential models to solve problems.

- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation 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.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.

National Common Core Standard(s):

Represent and solve equations and inequalities graphically

- **CC.9-12.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.

Interpret the structure of expressions

- **CC.9-12.A.SSE.2** Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
- **CC.9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
 - c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $[1.15^{(\frac{1}{12})}]^{(12t)} \approx 1.012^{(12t)}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

Analyze functions using different representations

- **CC.9-12.F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- Graph exponential and logarithmic functions, showing intercepts, and end behavior, trigonometric functions, showing period, midline, and amplitude.
- **CC.9-12.F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
 - b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t, y = (0.97)^t, y = (1.01)^{12t}, y = (1.2)^{(\frac{t}{10})}$, and classify them as representing exponential growth and decay.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CC.9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CC.9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

ISTE Standards:

1. Creativity and Innovation – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
 - b. Create original works as a means of personal or group expression
 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
 - a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
 - b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
 - d. Contribute to project teams to produce original works or solve problems
3. Research and Information Fluency – Students apply digital tools to gather, evaluate, and use information.
 - a. Plan strategies to guide inquiry
 - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
 - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
 - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making – Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
 - a. Identify and define authentic problems and significant questions for investigation
 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions
5. Digital Citizenship – Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
 - c. Demonstrate personal responsibility for lifelong learning
 - d. Exhibit leadership for digital citizenship
6. Technology Operations and Concepts – Students demonstrate a sound understanding of technology concepts, systems, and operations.
 - a. Understand and use technology systems
 - b. Select and use applications effectively and productively

Career Education and Work Standards:

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.
- 13.1.11.E Justify the selection of a career.
- 13.1.11.H Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.

Connecting to Common Core and Other Standards:

- PA Standards found at www.pdesas.org/standards/standardsdownloads
- National Common Core found at www.corestandards.org
- ISTE found at www.iste.org/standards/nets-for-students.aspx
- Career Education and Work found at www.pacareerstandards.com/
- *See Appendix for complete documents.

ELL Differentiation:

- Math & LA specifics found at www.pde.sas.org/module/sas/curriculumframework/elloverlay.aspx
- Generic found at <http://www.easad.net/esl>
- TODOS Resources www.todos-math.org

Enrichment:

- Write and graph exponential growth functions
- Solve problems involving compound interest
- Write and graph exponential decay functions
- Geometric sequences
- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

- Rules of exponents.
- Use order of operations to simplify and evaluate expressions and formulas.
- Classify and compare real numbers.
- Operations with rational numbers.
- Combining like terms.
- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>

East Stroudsburg Area School District
Algebra 1

IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.1.1 A1.1.1.1.2 A1.1.1.3.1 A1.1.1.4.1	<ul style="list-style-type: none"> • Represent and/or use numbers in equivalent forms. • Apply number theory concepts to show relationships between real numbers in problem solving settings. • Use exponents, roots, and/or absolute values to solve problems. (Exponents should be integers from -10 to 10.) • Zero and Negative Exponents • Multiplication Properties of Exponents • Division Properties of Exponents • Scientific Notation • Square Roots • Use estimation strategies in problem-solving situations. 	<ul style="list-style-type: none"> • Compare and/or order any real numbers (rational or irrational) • Distinguish between rational and irrational numbers using their properties • Estimate irrational number by comparing them to rational numbers • Evaluate and simplify expressions containing zero and negative exponents • Rewrite exponential expressions to include only positive exponents • Write and use numbers in scientific notation • Convert numbers from standard to/from scientific notation • Multiply/Divide powers with the same base • Use multiplication properties of exponents • Simplify/evaluate expressions by raising a power to a power • Use division properties of exponents • Evaluate and approximate square roots 	<ul style="list-style-type: none"> • Equivalent • Equivalent Form(s) • Base • Exponent • Root(s) • Absolute Value • Exponential Functions • Exponential Growth • Power • Scientific Notation • Standard Form • Laws of Exponents • Rational Number • Irrational Number • Real Numbers • Integers • Estimation • Square Roots 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary (Continued from Above)	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.3.1	<ul style="list-style-type: none"> • Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. • Construct and/or compare quadratic and/or exponential models to solve problems. 	<ul style="list-style-type: none"> • Identify solution(s) when solving problems involving exponents. <i>For example, for what values of x is $x^3 \geq x^2$ true for all real values of x?</i> • Estimate irrational numbers by comparing them to rational numbers • Simplify/evaluate expressions involving laws of exponents, roots, and/or absolute values to solve problems 	<ul style="list-style-type: none"> • Absolute Value • Exponents • Real Values • Real Numbers • Rational Numbers • Irrational Numbers • Expressions • Equations • Models • Quadratic Models • Exponential Models • Exponential Functions • Elimination • Infinity • Infinitely Many Solutions • Coincident Lines • No Solution • Null Set • Empty Set • Solution of a System • Solution Set • Substitution Method • System of Linear Equations • System of Linear Inequalities 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Algebra 1

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Unit 6: Polynomials and Factoring

Course Time Prior to Keystone/PSSA:

- Periods – 18
- Blocks – 8

Overview: Students will be able to:

- Add, subtract, and/or multiply polynomial expressions.
- Classify and graph polynomial functions and to solve their associated polynomial equations.
- Factor polynomial expressions, including special cases like perfect squares and the difference of squares.
- Simplify algebraic expressions and write them in equivalent forms.
- Extend their understanding of exponents and roots to factor and solve polynomial equations.

Unit Essential Questions:

- How are the Greatest Common Factor and the Distributive Property used to factor polynomials?
- How are Punnett Squares used in factoring trinomials?
- If you know the product or one of its factors, how can you find the other factor of the polynomial?
- What does FOIL represent?

Keystone Content Module/Assessment Anchor:

- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- **A1.1.1.2** Apply number theory concepts to show relationships between real numbers in problem solving settings.
- **A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems.
- **A1.1.1.5** Simplify expressions involving polynomials.

Keystone Eligible Content:

- **A1.1.1.1.2** Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$).
- **A1.1.1.2.1** Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- **A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from -10 to 10.
- **A1.1.1.5.1** Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.
- **A1.1.1.5.2** Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form $ax^2 + bx + c$ where a is equal to 1 after factoring out all monomial factors.
- **A1.1.1.5.3** Simplify/reduce a rational algebraic expression.

Pennsylvania Common Core Standard(s):

- **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.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.
- **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.2** Write expressions in equivalent forms to solve 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.6** Extend knowledge of rational functions to rewrite in equivalent forms.
- **CC.2.1.6.E.3** Develop and/or apply number theory concepts to find common factors and multiples.

National Common Core Standard(s):

Perform arithmetic operations on polynomials

- **CC.9-12.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.

Rewrite rational expressions

- **CC.9-12.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.

Write expressions in equivalent forms to solve problems

- **CC.9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
 - a. Factor a quadratic expression to reveal the zeros of the function it defines.
 - b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Analyze functions using different representations

- **CC.9-12.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, and symmetry of the graph, and interpret these in terms of a context.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

ISTE Standards:

1. Creativity and Innovation – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
 - b. Create original works as a means of personal or group expression
 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
 - a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
 - b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
 - d. Contribute to project teams to produce original works or solve problems

3. Research and Information Fluency – Students apply digital tools to gather, evaluate, and use information.
 - a. Plan strategies to guide inquiry
 - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
 - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
 - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making – Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
 - a. Identify and define authentic problems and significant questions for investigation
 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions
5. Digital Citizenship – Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
 - c. Demonstrate personal responsibility for lifelong learning
 - d. Exhibit leadership for digital citizenship
6. Technology Operations and Concepts – Students demonstrate a sound understanding of technology concepts, systems, and operations.
 - a. Understand and use technology systems
 - b. Select and use applications effectively and productively

Career Education and Work Standards:

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.
- 13.1.11.E Justify the selection of a career.
- 13.1.11.H Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.

Connecting to Common Core and Other Standards:

- PA Standards found at www.pdesas.org/standards/standardsdownloads
- National Common Core found at www.corestandards.org
- ISTE found at www.iste.org/standards/nets-for-students.aspx
- Career Education and Work found at www.pacareerstandards.com/
- *See Appendix for complete documents.

ELL Differentiation:

- Math & LA specifics found at www.pde.sas.org/module/sas/curriculumframework/elloverlay.aspx
- Generic found at <http://www.easad.net/esl>
- TODOS Resources www.todos-math.org

Enrichment:

- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

- Use order of operations to simplify and evaluate expressions and formulas.
- Rules of exponents.
- Combining like terms.
- Factoring whole numbers.
- Internet/Research Activities
 - www.studyisland.com
 - <https://www.thelearningodyssey.com/>
 - <http://www.khanacademy.org/>
 - <http://www.classzone.com/cz/login.htm>

IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

East Stroudsburg Area School District
Keystone Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.1.2 A1.1.1.2.1 A1.1.1.3.1 A1.1.1.5.3	<ul style="list-style-type: none"> • Apply number theory concepts to show relationships between real numbers in problem-solving settings. • Use exponents, roots, and/or absolute values to solve problems. • Monomials • Binomials • Trinomials • Polynomials • Greatest Common Factor (GCF) • Least Common Multiple (LCM) • Polynomial Degree 	<ul style="list-style-type: none"> • Multiply binomials • Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for a set of monomials • Factor out a monomial from a polynomial • Describe and/or name polynomials based standard form and degree • Add and subtract monomials • Add and subtract polynomials • Multiply a monomial and a polynomial • Multiply two binomials • Multiply polynomials vertically and horizontally • Multiply a binomial and trinomial • Solve area and volume problems involving monomials, binomials, and trinomials • Use long division to factor polynomials • Solve radicals using inverse operations • Use square roots to factor polynomials 	<ul style="list-style-type: none"> • Exponents • Roots • Absolute Value • Binomial • Coefficient • Leading Coefficient • Degree of a Monomial • Factor • GCF • LCM • Polynomial • Quadratic • Term • Trinomial • Monomial • Polynomial • Constant • Linear • Quadratic • Cubic • Greatest Common Factor (GCF) • Least Common Multiple (LCM) • Polynomial Degree 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page • YouTube • ESASD Valuable Video Library 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

		<ul style="list-style-type: none"> Factor quadratic expressions where $a = 1$ 			
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Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary (Continue from Above)	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.5.1 A1.1.1.5.2 A1.1.1.5.3	<ul style="list-style-type: none"> Simplify square roots Simplify expressions involving polynomials Factor algebraic expressions, including difference of squares and trinomials. Simplify/reduce a rational algebraic expression. Extend the knowledge of arithmetic operations and apply to polynomials. Factoring Completing the square 	<ul style="list-style-type: none"> Factor quadratic expressions where $a > 1$ Factor trinomials after first finding the GCF Factor difference of squares binomials Factor perfect square trinomials Solve quadratic equations by factoring Solve quadratic equations by completing the square Use factoring to find the zeros, extreme values, and the symmetry of the graph. Use polynomials to solve problems Solve polynomials in factored form Write expressions in equivalent forms to solve problems Rewrite rational functions/equations in equivalent forms Solve real-world problems involving factoring of polynomials and multiplication of 	<ul style="list-style-type: none"> Exponents Roots Absolute Value Binomial Coefficient Degree Factor Factoring GCF LCM Polynomial Quadratic Term Trinomial Monomial Constant Linear Quadratic Cubic Greatest Common Factor (GCF) Least Common Multiple (LCM) Polynomial Degree Completing the Square Function Rational Function Equivalent Forms Equation 	<ul style="list-style-type: none"> www.classzone.com www.hippocampus.org www.phschool.com www.StudyIsland.com https://www.thelearningodyssey.com/ http://www.khanacademy.org/ www.usatestprep.com https://www.thelearningodyssey.com/ Algebra 1, Concepts and Skills, (McDougal Littell, 2004) Algebra 1, (McDougal Littell, 2007) Algebra 1, Prentice Hall, 2007 Common Core Algebra 1, (Pearson 2012) OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010) McDougal Littell & Prentice Hall teaching resources Calculators New & updated resources available on departmental page YouTube ESASD Valuable Video Library 	<ul style="list-style-type: none"> Tests/quizzes CDTs Compass Learning Study Island Observation Homework Class Work Projects Journals Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

		monomials and/or binomials.	<ul style="list-style-type: none">• Zeroes• Extreme Values• Symmetry• Symmetry of Graph		
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Unit 7: Radicals

Course Time Prior to Keystone/PSSA:

- Periods – 10
- Blocks – 5

Overview: Students will be able to:

- Simplify radical expressions.
- Develop understanding of the ways in which irrational numbers are different from rational numbers.

Unit Essential Questions:

- How can you use the properties of radicals in expressions and equations?
- How do you work with radicals in geometry?
- How do exponents and radicals relate?
- How does understanding equivalent forms of numbers help us to differentiate between rational and irrational numbers?

Keystone Content Module/Assessment Anchor:

- **A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems.
- **A1.1.1.4** Use estimation strategies in problem-solving situations.
- **A1.1.1.5** Simplify expressions involving polynomials.

Keystone Eligible Content:

- **A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from -10 to 10.
- **A1.1.1.4.1** Use estimation to solve problems.
- **A1.1.1.5.3** Simplify/reduce a rational algebraic expression.

Pennsylvania Common Core Standard(s):

- **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.C.5** Construct and compare linear, quadratic and/or exponential models to solve problems.

National Common Core Standard(s):

Extend the properties of exponents to rational exponents

- **CC.9-12.N.RN.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{(1/3)}$ to be the cube root of 5 because we want $[5^{(1/3)}]^3 = 5^{[(1/3) \times 3]}$ to hold, so $[5^{(1/3)}]^3$ must equal 5.*
- **CC.9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers

- **CC.9-12.N.RN.3** Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CC.9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CC.9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

ISTE Standards:

1. Creativity and Innovation – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
 - b. Create original works as a means of personal or group expression
 - c. Use models and simulations to explore complex systems and issues
2. Communication and Collaboration – Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
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 - a. Plan strategies to guide inquiry
 - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
 - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
 - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making – Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
 - a. Identify and define authentic problems and significant questions for investigation
 - b. Plan and manage activities to develop a solution or complete a project
 - c. Collect and analyze data to identify solutions and/or make informed decisions
 - d. Use multiple processes and diverse perspectives to explore alternative solutions
5. Digital Citizenship – Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
 - a. Advocate and practice safe, legal, and responsible use of information and technology
 - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
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6. Technology Operations and Concepts – Students demonstrate a sound understanding of technology concepts, systems, and operations.
 - a. Understand and use technology systems
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Career Education and Work Standards:

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.

- 13.1.11.E Justify the selection of a career.
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 - <http://www.classzone.com/cz/login.htm>
- Group/Research Projects

Remediation:

- Factor trees
- Simplifying square roots
- Rules of exponents
- Internet/Research Activities
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IEP/GIEP: Refer to individual student's education plan under specially designed instruction.

East Stroudsburg Area School District
Keystone Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.1.1.3.1 A1.1.1.4.1 A1.1.1.5.3	<ul style="list-style-type: none"> • Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems • Use estimation to solve problems • Simplify/reduce a rational algebraic expression • Operations with Radical Expressions • Rational Exponents 	<ul style="list-style-type: none"> • Evaluate square roots given a value for the variable • Approximate a square root • Graph and order real numbers • Add, subtract, multiply, and divide radicals • Simplify radicals using all four operations • Write radicals as rational exponents • Solve equations with radicals using inverse operations • Solve an equation with an extraneous solution • Find and/or identify irrational solutions • Solve complex fractions with radical expressions • Solve problems applying the Pythagorean Theorem and its converse • Solve problems using the distance and midpoint formula • Solve real-world problems 	<ul style="list-style-type: none"> • Radical • Radical Expressions • Rational • Rational Exponents • Square Root • Square Root Function • Rationalizing the Denominator • Radical Equation • Complex Fraction • Pythagorean Theorem • Distance Formula • Midpoint Formula 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills</u>, (McDougal Littell, 2004) • <u>Algebra 1</u>, (McDougal Littell, 2007) • <u>Algebra 1</u>, Prentice Hall, 2007 • <u>Common Core Algebra 1</u>, (Pearson 2012) • <u>OnCore Mathematics, Algebra 1</u>, (Houghton Mifflin Harcourt, 2010) • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page • YouTube • ESASD Valuable Video Library 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

East Stroudsburg Area School District
Keystone Algebra 1

Unit 8: Rational Expressions and Equations

Course Time Prior to Keystone/PSSA:

- Periods – 13
- Blocks – 6

Overview: Students will be able to:

- Perform basic operations with ratio expressions, solve rational equations, and simplify rational expressions involving complex fractions.
- Apply multiple simplification techniques in the problem-solving process.
- Apply appropriate methods to solving problems, apply algebraic techniques while solving problems, and determine whether the solutions found are acceptable for the problem being solved.

Unit Essential Questions:

- How can we extend arithmetic properties and processes to algebraic expressions and processes?
- How can we use these properties and processes to solve problems?

Keystone Content Module/Assessment Anchor:

- **A1.1.1.2** Apply number theory concepts to show relationships between real numbers in problem solving settings.
- **A1.1.1.5** Simplify expressions involving polynomials.
- **A1.1.2.1** Write, solve, and/or graph linear equations using various methods.
- **A1.1.2.2** Write, solve, and/or graph systems of linear equations using various methods.

Keystone Eligible Content:

- **A1.1.1.2.1** Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- **A1.1.1.5.2** Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form $ax^2 + bx + c$ where a is equal to 1 after factoring out all monomial factors.
- **A1.1.1.5.3** Simplify/reduce a rational algebraic expression.
- **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations).
- **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.

Pennsylvania Common Core Standard(s):

- **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.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.
- **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.2** Write expressions in equivalent forms to solve 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.6** Extend knowledge of rational functions to rewrite in equivalent forms.
- **CC.2.1.6.E.3** Develop and/or apply number theory concepts to find common factors and multiples.

National Common Core Standard(s):

Perform arithmetic operations on polynomials

- **CC.9-12.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.

Rewrite rational expressions

- **CC.9-12.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.

Write expressions in equivalent forms to solve problems

- **CC.9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
 - a. Factor a quadratic expression to reveal the zeros of the function it defines.
 - b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Analyze functions using different representations

- **CC.9-12.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, and symmetry of the graph, and interpret these in terms of a context.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

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East Stroudsburg Area School District
Keystone Algebra 1

Remediation:

- Use order of operations to simplify and evaluate expressions and formulas.
- Rules of exponents.
- Combining like terms.
- Factoring whole numbers.
- Internet/Research Activities
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Keystone Algebra 1

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				• ESASD Valuable Video Library	
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Unit 9: Data Analysis – This unit should be embedded throughout the course of instruction.

Course Time Prior to Keystone/PSSA:

- Periods – 22
- Blocks – 10

Overview: Students will be able to:

- Explore a variety of data representations in order to understand the concepts of measures of center and spread, understand the concept of correlation, represent, analyze, and interpret data, draw conclusions, and make predictions.
- Compare data sets and solve real-world problems.

Unit Essential Questions:

- What are the components of measures of center and spread, and which measure of center is most appropriate in different situations?
- How do we know which data representation is most appropriate in a given situation?
- How can we use various representations to analyze, interpret, draw conclusions, and make predictions?
- When do we need to discuss correlation of data?
- What information can we glean from a scatter plot?
- How do we make predictions based on the outcomes of a probability experiment?
- How can we use data to make predictions about the future?

Keystone Content Module/Assessment Anchor:

- **A1.2.3.1** Use measures of dispersion to describe a set of data.
- **A1.2.3.2** Use data displays in problem-solving settings and/or to make predictions.
- **A1.2.3.3** Apply probability to practical situations.

Keystone Eligible Content:

- **A1.2.3.1.1** Calculate and/or interpret the range, quartiles, and interquartile range of data.
- **A1.2.3.2.1** Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations.
- **A1.2.3.2.2** Analyze data, make predictions, and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations).
- **A1.2.3.2.3** Make predictions using the equations or graphs of best-fit lines of scatter plots.
- **A1.2.3.3.1** Find probabilities for compound events (e.g., find probability of red and blue, find probability of red or blue) and represent as a fraction, decimal, or percent.

Pennsylvania Common Core Standard(s):

- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.

- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.4.HS.B.5** Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
- **CC.2.4.HS.B.4** Recognize and evaluate random processes underlying statistical experiments.
- **CC.2.4.HS.B.7** Apply the rules of probability to compute probabilities of compound events in a uniform probability model.

National Common Core Standard(s):

Summarize, represent, and interpret data on a single count or measurement variable

- **CC.9-12.S.ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).
- **CC.9-12.S.ID.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- **CC.9-12.S.ID.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- **CC.9-12.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.
- **CC.9-12.S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- **CC.9-12.S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
 - a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
 - b. Informally assess the fit of a function by plotting and analyzing residuals.
 - c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

- **CC.9-12.S.ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- **CC.9-12.S.ID.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.
- **CC.9-12.S.ID.9** Distinguish between correlation and causation.

Reason quantitatively and use units to solve problems

- **CC.9-12.N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
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Keystone Algebra 1

Keystone Anchors & Eligible Content	Unit Concepts What students need to know	Unit Competencies What students need to be able to do (skills): (Students will:)	Content Vocabulary	Materials, Resources, & Instructional Activities	Assessments
A1.2.3.2.3 A1.2.3.3.1	<ul style="list-style-type: none"> • Use data displays in problem-solving settings and/or to make predictions. • Apply probability to practical situations. • Scatter Plots • Correlations • Line of Best Fit 	<ul style="list-style-type: none"> • Make predictions using the equations or graphs of best-fit lines of scatter plots. • Determine the correlation shown by a scatter plot • Write the equation for the line of best fit. • Find probabilities for compound events (e.g., find probability of red and blue, find probability of red or blue) and represent as a fraction, decimal, and/or percent. 	<ul style="list-style-type: none"> • Scatter Plot • Stem-and-Leaf Plot • Equation • Equivalent Values (ex. one-half can be represented as $\frac{1}{2}$ or 0.5 or 50%) • Line of Best Fit (or Best Fit Line) • Dot Plot • Box-and-Whisker Plot • Probability • Compound Event 	<ul style="list-style-type: none"> • www.classzone.com • www.hippocampus.org • www.phschool.com • www.StudyIsland.com • https://www.thelearningodyssey.com/ • http://www.khanacademy.org/ • www.usatestprep.com • https://www.thelearningodyssey.com/ • http://evl.esasd.net/SafeVideos/ • http://math.ucdenver.edu/~rbyrne/flash.htm • http://www.mathtv.com/videos_by_topic • <u>Algebra 1, Concepts and Skills, (McDougal Littell, 2004)</u> • <u>Algebra 1, (McDougal Littell, 2007)</u> • <u>Algebra 1, Prentice Hall, 2007</u> • <u>Common Core Algebra 1, (Pearson 2012)</u> • <u>OnCore Mathematics, Algebra 1, (Houghton Mifflin Harcourt, 2010)</u> • McDougal Littell & Prentice Hall teaching resources • Calculators • New & updated resources available on departmental page 	<ul style="list-style-type: none"> • Tests/quizzes • CDTs • Compass Learning • Study Island • Observation • Homework • Class Work • Projects • Journals • Bell Ringers

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