

**Brick Township Public Schools MATHEMATICS CURRICULUM**

**Grade: 8<sup>th</sup> & 9<sup>th</sup>**

Aligned to the New Jersey Student Learning Standards

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS**

**BRICK TOWNSHIP PUBLIC SCHOOLS  
ALGEBRA I CURRICULUM**

**Content Area:** Mathematics

**Course Title:** Algebra 1

**Grade Level:** 8<sup>th</sup> & 9<sup>th</sup>

**Note: highlighted standards will be evaluated on the PARCC**

<b>Unit Plan 1</b> Linear Equations/Inequalities, Absolute Value Equations	<b>5 weeks</b>
<b>Unit Plan 2</b> Writing, Evaluating and Graphing of Linear Functions, Linear Inequalities, Absolute Value Functions and Transformation of Functions	<b>5 weeks</b>
<b>Unit Plan 3</b> Systems of Equations and Inequalities	<b>3 weeks</b>
<b>Unit Plan 4</b> Properties of Exponents, Exponential Functions, Scientific Notation	<b>3 weeks</b>
<b>Unit Plan 5</b> Polynomials: Factor and Operations	<b>4 weeks</b>
<b>Unit Plan 6</b> Quadratics: Solving and Graphing	<b>5 weeks</b>
<b>Unit Plan 7</b> Radical Functions	<b>2 weeks</b>
<b>Unit Plan 8</b> Data Analysis	<b>2 weeks</b>

**Created on: June 2015 - Revised on June: 2017 - Board Approved on: September 14, 2017**

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The following Standards for Mathematical Practice will be covered throughout each unit of the curriculum.

MP.1	Make sense of problems and persevere in solving them.	<ul style="list-style-type: none"><li>• Find meaning in problems</li><li>• Look for entry points</li><li>• Analyze, conjecture and plan solution pathways</li><li>• Monitor and adjust</li><li>• Verify answers</li><li>• Ask themselves the question: “Does this make sense?”</li></ul>
MP.2	Reason abstractly and quantitatively.	<ul style="list-style-type: none"><li>• Make sense of quantities and their relationships in problems</li><li>• Learn to contextualize and decontextualize</li><li>• Create coherent representations of problems</li></ul>
MP.3	Construct viable arguments and critique the reasoning of others.	<ul style="list-style-type: none"><li>• Understand and use information to construct arguments</li><li>• Make and explore the truth of conjectures</li><li>• Recognize and use counterexamples</li><li>• Justify conclusions and respond to arguments of others</li></ul>
MP.4	Model with Mathematics.	<ul style="list-style-type: none"><li>• Apply mathematics to problems in everyday life</li><li>• Make assumptions and approximations</li><li>• Identify quantities in a practical situation</li><li>• Interpret results in the context of the situation and reflect on whether the results make sense</li></ul>
MP.5	Use appropriate tools strategically.	<ul style="list-style-type: none"><li>• Consider the available tools when solving problems</li><li>• Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools)</li><li>• Make sound decisions of which of these tools might be helpful</li></ul>
MP.6	Attend to precision.	<ul style="list-style-type: none"><li>• Communicate precisely to others</li><li>• Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes</li><li>• Calculate accurately and efficiently</li></ul>
MP.7	Look for and make use of structure.	<ul style="list-style-type: none"><li>• Discern patterns and structures</li><li>• Can step back for an overview and shift perspective</li><li>• See complicated things as single objects or as being composed of several objects</li></ul>
MP.8	Look for and express regularity in repeated reasoning.	<ul style="list-style-type: none"><li>• Notice if calculations are repeated and look both for general methods and shortcuts</li><li>• In solving problems, maintain oversight of the process while attending to detail</li><li>• Evaluate the reasonableness of their immediate results</li></ul>

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**Algebra I: UNIT 1**

**Content Area:** Mathematics

**Unit Title:** Linear Equations/Inequalities, Absolute Value Equations, and Function Notation

**Target Course/Grade Level:** Algebra I, 8<sup>th</sup> & 9<sup>th</sup>

**Unit Summary:** Manipulating expressions, equations and inequalities algebraically to evaluate expressions and solve equations and inequalities.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLs for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLs Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-CED.A.1</b>	Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions</i>
<b>A-CED.A.4</b>	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law <math>V = IR</math> to highlight resistance <math>R</math>.</i>
<b>A-REI.A.1</b>	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.
<b>A-REI.B.3</b>	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
<b>N-Q.A.1</b>	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.

**Unit Essential Questions**

- How do you translate real-life situations into equations and inequalities?
- How do you solve equations and inequalities using algebra and other strategies?

**Unit Enduring Understandings**

*Students will understand that...*

- Equation solving is working backward and undoing operations.
- The solution to an inequality is a set, not just a single solution.
- There is a connection between absolute value and linear equations.

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### Unit Objectives

*Students will know...*

- How to translate expressions and statements into algebraic expressions, equations, and inequalities.
- How to simplify expressions using order of operations, the distributive property, and combining like terms.
- How to translate expressions and statements into algebraic expressions, equations, and inequalities.
- How to evaluate variable expressions.
- How to check solutions of equations and inequalities.
- How to use a process including properties of equality and justification to solve equations and inequalities.
- The sign-change rule for multiplying or dividing both sides of a one variable inequality by a negative number.
- How to solve literal equations for given variable.
- How to solve absolute value equations that contain 0, 1, or 2 solutions.

### Unit Objectives

*Students will be able to...*

- Solve a wide variety of equations and inequalities using aforementioned skills.

## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
- Class participation
- Exit tickets
- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
- Writing Prompts
- Journals
- Homework
- Worksheets
- Quizzes
- Self-Assessment
- Online Assignments

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### **Summative Assessments**

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

### **Modifications (Special Education, ELLs, Gifted and Talented)**

#### **Special Education:**

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### **English Language Learners:**

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

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## **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
- Differentiated instruction
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Small group instruction as needed
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Movement from teacher-directed learning to student-directed learning

## **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**

- Textbook (Big Ideas – Algebra 1)
- Graphing Calculator
- Microsoft Excel/PowerPoint
- Textbook and teacher-made tests, worksheets, warm-ups, and quizzes
- Computer software to support unit
- Smart board
- Document Camera
- [www.ixl.com](http://www.ixl.com)
- [www.purplemath.com](http://www.purplemath.com)
- [www.Kutasoftware.com](http://www.Kutasoftware.com)
- [www.Khanacademy.com](http://www.Khanacademy.com)
- [www.brightstorm.com](http://www.brightstorm.com)
- [www.coolmath.com](http://www.coolmath.com)
- [www.desmos.com](http://www.desmos.com)

## **Teacher Notes:**

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**Algebra I: UNIT 2**

**Content Area: Mathematics**

**Unit Title:** Writing and Graphing of Linear Functions, Linear Inequalities, Absolute Value Functions and Transformations of Functions

**Target Course/Grade Level: Algebra I – 8<sup>th</sup> & 9<sup>th</sup>**

**Unit Summary**

Model real-world data by two-variable graphing. By using algebra skills, be able to predict outcomes or estimate unknown data related to given data. Apply skills from linear equations to both inequalities and absolute value graphs. Graph, evaluate, and model real life situations with functions.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLS for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

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CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLS Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-CED.2</b>	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
<b>A-SSE.1-1</b>	Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients. Interpret complicated expressions by viewing one or more of their parts as a single entity
<b>A-SSE.1-2</b>	Use the structure of an expression to identify ways to rewrite it. <i>For example, see <math>x^4 - y^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</i>
<b>A-REI.10</b>	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).
<b>A-REI.12</b>	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.
<b>F-BF.A.1a</b>	Determine an explicit expression, a recursive process, or steps for calculation from a context.
<b>F-BF.A.2</b>	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
<b>F-BF.B.3</b>	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them.</i>
<b>F-IF.A.1</b>	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 $y = f(x)$ .
<b>F-IF.A.2</b>	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
<b>F-IF.A.3</b>	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. <i>For example, the Fibonacci sequence is defined recursively by <math>f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)</math> for <math>n \geq 1</math>.</i>
<b>F-IF.B.4</b>	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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
<b>F-IF.B.5</b>	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>For example, if the function <math>h(n)</math> gives the number of person-hours it takes to assemble <math>n</math> engines in a factory, then the positive integers would be an appropriate domain for the function.</i>

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<b>F-IF.C.7a</b>	Graph linear and quadratic functions and show intercepts, maxima, and minima.
<b>F-IF.C.7b</b>	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
<b>F-IF.C.9</b>	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i>
<b>F-LE.A.1b</b>	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
<b>F-LE.A.2</b>	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).
<b>F-LE.B.5</b>	Interpret the parameters in a linear or exponential function in terms of a context.
<b>S-ID.B.6a</b>	Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.</i>
<b>S-ID.B.6b</b>	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
<b>S-ID.B.6c</b>	Fit a linear function for a scatter plot that suggests a linear association.
<b>S-ID.C.7</b>	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
<b>S-ID.C.8</b>	Compute (using technology) and interpret the correlation coefficient of a linear fit.
<b>S-ID.C.9</b>	Distinguish between correlation and causation.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• What is a function?</li> <li>• How can you determine whether a function is linear or nonlinear?</li> <li>• How can you use function notation to represent a function?</li> <li>• How can you describe the graph of the equation of <math>Ax + By = C</math>?</li> <li>• How can you describe the graph of the equation of <math>y = mx + b</math>?</li> <li>• How does the graph of the linear function <math>f(x)=x</math> compare the graphs of <math>g(x)=f(x) + c</math> and <math>h(x) = f(cx)</math>?</li> <li>• How do the values of <math>a</math>, <math>h</math>, and <math>k</math> affect the graph of the absolute value function <math>g(x) = a x - h  + k</math> ?</li> <li>• Given the graph of a linear function, how can you write the equation of a line?</li> <li>• How can you write the equation of a line when you are given the slope and a point on</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• The graph of a linear equation is a line.</li> <li>• Linear functions can be represented in different ways.</li> <li>• The graph of an absolute value function is a “v.”</li> <li>• Functions can be transformed.</li> <li>• The equation in multiple formats, and its application to inequalities and absolute value.</li> <li>• Line of fit will allow students to predict unknown values.</li> <li>• Function notation provides instructions to be applied to mathematical expressions.</li> <li>• Input and output values in a table can be translated to a graph as the x and y coordinates.</li> </ul>

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<p>the line?</p> <ul style="list-style-type: none"> <li>• How can you recognize that lines are parallel or perpendicular?</li> <li>• How can you use a scatter plot and a line of fit to make conclusions about data?</li> <li>• How can you use an arithmetic sequence to describe a pattern?</li> </ul>	
<p><b>Unit Objectives</b> <i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Plot points &amp; name coordinates of points on the coordinate plane.</li> <li>• How to calculate slope of a line using the formula <math>m = \frac{y_2 - y_1}{x_2 - x_1}</math></li> <li>• How to identify the slope of a line from its graph.</li> <li>• How to write the equation of a line given its graph or two points on the line.</li> <li>• How to write an equation in slope-intercept form, point-slope form, and standard form.</li> <li>• How to represent the solution of a two-variable equation as a linear graph.</li> <li>• How to graph real data as a scatter plot and estimate line of best fit to predict an outcome.</li> <li>• How to calculate linear regression with a graphing calculator.</li> <li>• How to represent the solution of a two-variable inequality as a linear graph.</li> <li>• How to use the graphing calculator to graph equations, inequalities, and system of equations/inequalities.</li> <li>• How to graph Absolute value equations.</li> <li>• How to use <math>f(n)</math> for a particular quantity n.</li> <li>• How to use <math>f(n)</math> to find the original quantity</li> <li>• How to translate a real world situation into <math>f(x)</math> notation.</li> <li>• How to graph an equation presented in <math>f(n)</math> notation.</li> <li>• How to find a point of intersection of two functions graphed on the coordinate plane.</li> </ul>	<p><b>Unit Objectives</b> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Graph a wide variety of equations and inequalities using aforementioned skills. Look at graphs and determine the matching equation.</li> <li>• Determine a value for n given the output <math>f(n)</math></li> <li>• Translate a real-world situation into <math>f(n)</math> notation, where <math>m</math> is the rate of change and <math>b</math> is the constant or starting point.</li> <li>• Graph an equation in <math>f(n)</math> notation given in a linear format (slope intercept/point slope) or quadratic format</li> <li>• Solve a system either by graphing or algebraically when the equations are given in <math>f(n)</math> format.</li> <li>• Evaluate <math>f(n)</math> for a given value n.</li> </ul>

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### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
- Class participation
- Exit tickets
- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
- Writing Prompts
- Journals
- Homework
- Worksheets
- Quizzes
- Self-Assessment
- Online Assignments

#### Summative Assessments

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

#### Modifications (Special Education, ELLs, Gifted and Talented)

##### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books

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- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### **English Language Learners:**

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
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- Instructional technology as needed/required
- Preferential Seating

#### **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
- Differentiated instruction
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
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- Movement from teacher-directed learning to student-directed learning

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## Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Textbook (Big Ideas – Algebra 1)
- Graphing Calculator
- Microsoft Excel/PowerPoint
- Textbook and teacher-made tests, worksheets, warm-ups, and quizzes
- Computer software to support unit
- Smart board
- Document Camera
- [www.ixl.com](http://www.ixl.com)
- [www.purplemath.com](http://www.purplemath.com)
- [www.Kutasoftware.com](http://www.Kutasoftware.com)
- [www.Khanacademy.com](http://www.Khanacademy.com)
- [www.brightstorm.com](http://www.brightstorm.com)
- [www.coolmath.com](http://www.coolmath.com)
- [www.desmos.com](http://www.desmos.com)

## Teacher Notes:

**Brick Township Public Schools MATHEMATICS CURRICULUM**

**Grade: 8<sup>th</sup> & 9<sup>th</sup>**

Aligned to the New Jersey Student Learning Standards

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS**

**BRICK TOWNSHIP PUBLIC SCHOOLS**

**Algebra I: UNIT 3**

**Content Area: Mathematics**

**Unit Title:** Systems of Equations and Inequalities

**Target Course/Grade Level:** Algebra 1 – 8<sup>th</sup> & 9<sup>th</sup>

**Unit Summary:** This unit focuses on solving systems of equations and inequalities using the graphing, substitution, and elimination methods. Students will solve systems with 0, 1, and infinitely many solutions.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLS for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLS Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-CED.A.2</b>	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
<b>A-CED.A.3</b>	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. <i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i>
<b>A-REI.C.5</b>	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.
<b>A-REI.C.6</b>	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
<b>A-REI.D.11</b>	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.
<b>A-REI.D.12</b>	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.

<b>Unit Essential Questions</b>	<b>Unit Enduring Understandings</b>
<ul style="list-style-type: none"> <li>• How are systems of equations solved using graphing, substitution, and elimination?</li> <li>• When is it appropriate to use each method?</li> <li>• What are the three types of solutions to a system?</li> <li>• What does the intersecting region of a system of inequalities represent?</li> <li>• How can real world situations be solved using a system of equations?</li> <li>• Can a System of Linear Equations have no solution or infinitely many solutions?</li> </ul>	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• The intersection of two lines provides a solution to the system.</li> <li>• Solving systems by graphing has its limitations.</li> <li>• Multiplying an entire equation by a non-zero constant does not change the value of the equation/inequality.</li> <li>• A solution to a system of equations has significance in the real world.</li> </ul>

<b>Unit Objectives</b>	<b>Unit Objectives</b>
<p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• There are various methods to solve systems of equations and inequalities.</li> <li>• When to employ a particular method to solve the systems of equations.</li> </ul>	<p><i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Solve systems using substitution.</li> <li>• Solve systems using elimination.</li> <li>• Solve systems using graphing.</li> <li>• Solve systems of linear inequalities.</li> <li>• Use systems to find the solutions to real world situations.</li> </ul>

# Brick Township Public Schools MATHEMATICS CURRICULUM

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## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
- Class participation
- Exit tickets
- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
- Writing Prompts
- Journals
- Homework
- Worksheets
- Quizzes
- Self-Assessment
- Online Assignments

#### Summative Assessments

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

#### Modifications (Special Education, ELLs, Gifted and Talented)

##### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books

## Brick Township Public Schools MATHEMATICS CURRICULUM

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- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### **English Language Learners:**

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

#### **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
- Differentiated instruction
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Small group instruction as needed
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Movement from teacher-directed learning to student-directed learning

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### Teacher Notes:

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**BICK TOWNSHIP PUBLIC SCHOOLS**

**Algebra I: UNIT 4**

**Content Area: Mathematics**

**Unit Title:** Properties of Exponents, Exponential Functions, Scientific Notation

**Target Course/Grade Level:** Algebra I - 8<sup>th</sup> & 9<sup>th</sup>

**Unit Summary:** Simplify expressions involving exponents and scientific notation. Model real world problems with exponential growth and decay equations and proportional applications.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLS for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLS Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

**Brick Township Public Schools MATHEMATICS CURRICULUM**

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
N-RN.A.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. <i>For example, we define <math>5^{1/3}</math> to be the cube root of 5 because we want <math>(5^{1/3})^3 = 5(1/3)^3</math> to hold, so <math>(5^{1/3})^3</math> must equal 5</i>
N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents
<b>A-CED.A.1</b>	Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions</i>
<b>A-CED.A.2</b>	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
<b>F-IF.A.3</b>	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. <i>For example, the Fibonacci sequence is defined recursively by <math>f(0) = f(1) = 1</math>, <math>f(n+1) = f(n) + f(n-1)</math> for <math>n \geq 1</math></i>
<b>F-IF.B.4</b>	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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
<b>F-IF.C.7</b>	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
<b>F-IF.C.8b</b>	Use the properties of exponents to interpret expressions for exponential functions. <i>For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)^{12t}</math>, <math>y = (1.2)^{t/10}</math>, and classify them as representing exponential growth or decay</i>
<b>F-IF.C.9</b>	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum</i>
<b>F-BF.A.1a</b>	Determine an explicit expression, a recursive process, or steps for calculation from a context
F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
<b>F-BF.B.3</b>	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them</i>
<b>F-LE.A.1a</b>	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals

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F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F-LE.A.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).
A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions. <i>For example the expression <math>1.15^t</math> can be rewritten as <math>(1.15^{1/12})^{12t} \approx 1.012^{12t}</math> to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</i>
A-REI.D.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.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How does exponential change differ from linear change?</li> <li>• How can we apply the concept of exponential growth to real world problems?</li> <li>• What are some of the characteristics of the graph of an exponential function?</li> <li>• What are some of the characteristics of exponential growth and exponential decay functions?</li> <li>• How can you solve an exponential equation graphically?</li> <li>• How are geometric sequences related to exponential functions?</li> </ul>	<p><b>Unit Enduring Understandings</b> <i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• There can still be a relationship between two numbers even if there is no linear pattern.</li> <li>• Proportional thinking is utilized to make educated predictions on larger populations based upon accepted facts and smaller samples.</li> <li>• Scientific notation can be used to represent extremely large or extremely small numbers.</li> <li>• Expressions involving exponents may be simplified</li> </ul>
<p><b>Unit Objectives</b> <i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• How to interpret and rewrite exponential growth and decay functions.</li> <li>• How to apply an equation and graph for exponential growth or decay to real life problems.</li> <li>• How to rewrite expressions using rules (properties) of exponents.</li> <li>• How to write numbers in scientific notation or standard notation.</li> <li>• How to rewrite an expression with exponents as an expression with the opposite of those exponents.</li> <li>• Identify, expand, write and graph geometric sequences.</li> </ul>	<p><b>Unit Objectives</b> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Simplify exponents using the laws of exponents. Write number in scientific notation and standard notation. Use proportional reasoning and exponential growth/decay equations to solve real world problems.</li> </ul>

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- How to solve exponential equations.
- How to write exponential equations that model real-world growth and decay data.

## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
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- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
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- Journals
- Homework
- Worksheets
- Quizzes
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- Online Assignments

#### Summative Assessments

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

#### Modifications (Special Education, ELLs, Gifted and Talented)

##### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded

## Brick Township Public Schools MATHEMATICS CURRICULUM

### Grade: 8<sup>th</sup> & 9<sup>th</sup>

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#### ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS

- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### English Language Learners:

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

#### Gifted and Talented/Honors:

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
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- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Small group instruction as needed
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Movement from teacher-directed learning to student-directed learning

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### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

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- Graphing Calculator
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### Teacher Notes:

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**BRICK TOWNSHIP PUBLIC SCHOOLS**

**Algebra I: UNIT 5**

**Content Area: Mathematics**

**Unit Title:** Polynomials: Factoring and Operations

**Target Course/Grade Level:** Algebra I – 8<sup>th</sup> & 9<sup>th</sup>

**Unit Summary**

Students will begin working with polynomials. After naming polynomials they will perform the basic operations on two or more polynomials. Students will also factor polynomials.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLs for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

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CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLs Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-APR.A.1</b>	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.
<b>A-APR.B.3</b>	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
<b>A-REI.B.4b</b>	Solve quadratic equations by inspection (e.g., for $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$ .
<b>A-SSE.A.2</b>	Use the structure of an expression to identify ways to rewrite it. <i>For example, see <math>x^4 - y^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</i>
<b>A-SSE.B.3a</b>	Factor a quadratic expression to reveal the zeros of the function it defines.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How can you add and subtract polynomials?</li> <li>• How can you multiply two polynomials?</li> <li>• How can you solve a polynomial equation?</li> <li>• How can you factor the trinomial <math>x^2 + bx + c</math> into the product of two binomials?</li> <li>• How can you factor the trinomial <math>ax^2 + bx + c</math> into the product of two binomials?</li> <li>• How can you recognize and factor special products?</li> <li>• How can you factor a polynomial completely?</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• Like integers, polynomials can be added, subtracted, and multiplied.</li> <li>• Recognize and evaluate polynomials.</li> <li>• Add, subtract, multiply and divide polynomials.</li> <li>• Factor polynomials.</li> </ul>
<p><b>Unit Objectives</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• How to simplify polynomial expressions using addition, subtraction, and multiplication.</li> <li>• How to factor a greatest common factor from a polynomial.</li> <li>• How to factor a trinomial to the product of two binomials.</li> <li>• How to factor a polynomial using the difference of two squares.</li> <li>• How to identify a polynomial function and determine its degree.</li> </ul>	<p><b>Unit Objectives</b></p> <p><i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Extend their study of functions to general polynomials.</li> <li>• They investigate the notation, concepts, and properties associated with polynomials, and perform operations.</li> <li>• Students also begin factoring polynomials.</li> </ul>

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## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

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- Worksheets
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#### Summative Assessments

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

#### Modifications (Special Education, ELLs, Gifted and Talented)

##### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books

## Brick Township Public Schools MATHEMATICS CURRICULUM

### Grade: 8<sup>th</sup> & 9<sup>th</sup>

Aligned to the New Jersey Student Learning Standards

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS**

- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### **English Language Learners:**

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

#### **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
- Differentiated instruction
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
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- Movement from teacher-directed learning to student-directed learning

## Brick Township Public Schools MATHEMATICS CURRICULUM

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### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Textbook (Big Ideas – Algebra 1)
- Graphing Calculator
- Microsoft Excel/PowerPoint
- Textbook and teacher-made tests, worksheets, warm-ups, and quizzes
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- [www.brightstorm.com](http://www.brightstorm.com)
- [www.coolmath.com](http://www.coolmath.com)
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### Teacher Notes:

**Brick Township Public Schools MATHEMATICS CURRICULUM**

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**BRICK TOWNSHIP PUBLIC SCHOOLS**

**Algebra I: UNIT 6**

**Content Area: Mathematics**

**Unit Title:** Quadratics: Solving and Graphing

**Target Course/Grade Level: Algebra I – 8<sup>th</sup> & 9<sup>th</sup>**

**Unit Summary**

The student will be able to graph a quadratic function. The student will be able to determine the effect of 'a' of  $y = ax^2$  for  $a > 1$  to determine the direction of the graph, the vertex point and whether the vertex point is a maximum or a minimum point. This lesson is designed to help students solve quadratic equations by using the Quadratic Formula, factoring, and graphing. Students will identify the most efficient method for solving a quadratic equation and solve the quadratic equation.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLs for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLs Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

**Brick Township Public Schools MATHEMATICS CURRICULUM**

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**Learning Targets**

<b>Content Standard</b>	
<b>CONTENT STANDARDS LINK: <a href="http://www.state.nj.us/education/cccs/2016/math/">http://www.state.nj.us/education/cccs/2016/math/</a></b>	
<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-CED.A.1</b>	Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i>
<b>A-CED.A.2</b>	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
<b>A-CED.A.4</b>	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law <math>V = IR</math> to highlight resistance <math>R</math>.</i>
<b>F-IF.B.4</b>	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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
<b>F-IF.B.6</b>	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.
<b>F-IF.C.7a</b>	Graph linear and quadratic functions and show intercepts, maxima, and minima.
<b>F-IF.C.8a</b>	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.
<b>F-BF.A.1a</b>	Determine an explicit expression, a recursive process, or steps for calculation from a context.
<b>F-BF.B.3</b>	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them.</i>
<b>F-LE.A.3</b>	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
<b>A-SSE.B.3a</b>	Factor a quadratic expression to reveal the zeros of the function it defines.
<b>A-SSE.B.3b</b>	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
<b>A-APR.B.3</b>	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
<b>A-REI.B.4a</b>	Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
<b>A-REI.B.4b</b>	Solve quadratic equations by inspection (e.g., for $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$ .

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A-REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. <i>For example, find the points of intersection between the line <math>y = -3x</math> and the circle <math>x^2 + y^2 = 3</math>.</i>
A-REI.D.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.
N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
N-RN.B.3	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• What are some of the characteristics of the graph of a quadratic function of the form <math>f(x) = ax^2</math>?</li> <li>• How does the value of <math>c</math> affect the graph of <math>f(x) = ax^2 + c</math>?</li> <li>• How can you find the vertex of the graph of <math>f(x) = ax^2 + bx + c</math>?</li> <li>• How can you describe the graph of <math>f(x) = a(x - h)^2</math>?</li> <li>• What are some of the characteristics of the graph of <math>f(x) = a(x - p)(x - q)</math>?</li> <li>• How can you compare the growth rates of linear, exponential, and quadratic functions?</li> <li>• How can you multiply and divide square roots?</li> <li>• How can you use a graph to solve a quadratic equation in one variable?</li> <li>• How can you determine the number of solutions of a quadratic equation of the form <math>ax^2 + c = 0</math>?</li> <li>• How can you use “completing the square” to solve a quadratic equation?</li> <li>• How can you solve a system of two equations when one is linear and the other is quadratic?</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• A quadratic function has the form <math>y = ax^2 + bx + c</math>, where <math>a \neq 0</math>.</li> <li>• A quadratic equation can be solved by applying a variety of techniques.</li> <li>• A quadratic equation can be solved by using a graphing calculator.</li> <li>• The graph of a quadratic function results in a parabola.</li> </ul>

# Brick Township Public Schools MATHEMATICS CURRICULUM

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## Unit Objectives

*Students will know...*

- How to solve quadratic functions.
- How to graph parabolas.
- How to find the x-intercepts of parabolas, roots and solutions.
- How to determine the vertex.
- How to find the maximum and minimum of the parabola.
- How to utilize the zero-product property to solve equations.
- How to factor and solve quadratic equations.
- How to solve quadratic equations using the quadratic formula.

## Unit Objectives

*Students will be able to...*

- Solve quadratic equations by factoring, completing the square, taking square roots, or the quadratic formula.
- Use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.
- Graph quadratic functions and know that their roots are the x-intercepts.
- Use the quadratic formula or factoring or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one or two points.

## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
- Class participation
- Exit tickets
- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
- Writing Prompts
- Journals
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- Chapter/Unit Tests
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# Brick Township Public Schools MATHEMATICS CURRICULUM

## Grade: 8<sup>th</sup> & 9<sup>th</sup>

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ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS

### Modifications (Special Education, ELLs, Gifted and Talented)

#### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### English Language Learners:

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

#### Gifted and Talented/Honors:

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
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- Teach cognitive and methodological skills
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## Brick Township Public Schools MATHEMATICS CURRICULUM

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### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Textbook (Big Ideas – Algebra 1)
- Graphing Calculator
- Microsoft Excel/PowerPoint
- Textbook and teacher-made tests, worksheets, warm-ups, and quizzes
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- [www.brightstorm.com](http://www.brightstorm.com)
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### Teacher Notes:

**Brick Township Public Schools MATHEMATICS CURRICULUM**

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**BRICK TOWNSHIP PUBLIC SCHOOLS**

**ALGEBRA 1: UNIT 7**

**Content Area: Mathematics**

**Unit Title: Radical Functions**

**Target Course/Grade Level: Algebra I – 8<sup>th</sup> & 9<sup>th</sup>**

**Unit Summary:** This unit focuses on simplifying radical expressions and performing basic operations on radical expressions. Students will also learn to graph radical functions and solve radical equations.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLS for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLS Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>A-CED.A.1</b>	Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions</i>
<b>A-CED.A.2</b>	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
<b>F-IF.B.4</b>	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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
<b>F-IF.B.6</b>	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.
<b>F-IF.C.7b</b>	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions
<b>F-IF.C.9</b>	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum</i>
<b>F-BF.B.4a</b>	Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse. <i>For example, <math>f(x) = 2x^3</math> or <math>f(x) = (x+1)/(x-1)</math> for <math>x \neq 1</math>.</i>
<b>N-RN.A.2</b>	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
<b>REI.A.2</b>	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise

**Unit Essential Questions**

- What are some of the characteristics of the graph of a square root and cube functions?
- How can you solve an equation that contains square root?
- How are a function and its inverse related?

**Unit Enduring Understandings**

*Students will understand that...*

- The knowledge of radicals is a basis for higher level mathematics
- Radical expression with like radicals can be added or subtracted.
- Radical expressions must be in simplest form.
- The graph of a square root function has unique characteristics.

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## Unit Objectives

*Students will know...*

- How to solve radical equations and identify extraneous solutions.
- How to graph square root and cube root functions
- How to find inverses of functions algebraically
- How to find inverses of relations

## Unit Objectives

*Students will be able to...*

- Solve radical equations and identify extraneous solutions
- Graph the parent square root and cube root functions
- Graph the transformations of square root functions
- Find inverse functions

## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

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## Brick Township Public Schools MATHEMATICS CURRICULUM

### Grade: 8<sup>th</sup> & 9<sup>th</sup>

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#### ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS

- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
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- Breakdown task into manageable units
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#### **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
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- Real world application
- Rigorous tasks
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### Teacher Notes:

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**BRICK TOWNSHIP PUBLIC SCHOOLS**

**Algebra 1: Unit 8**

**Content Area: Mathematics**

**Unit Title:** Data Analysis

**Target Course/Grade Level: Algebra I – 8th & 9th**

**Unit Summary**

Students will collect, organize, analyze, and describe data. From these data displays students will make inferences and convincing arguments based on data analysis.

**Primary interdisciplinary connections:**

Infused within the unit are connections to the 2016 NJSLs for Mathematics, Language Arts Literacy, Science and Technology. <http://www.state.nj.us/education/cccs/>

**21<sup>st</sup> Century Themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career standards:

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

**Technology connections:**

Infused within the unit are connections to the NJSLs Educational Technology standard 8.1.

<http://www.nj.gov/education/cccs/2014/tech/>

**8.1 Educational Technology**

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

**Brick Township Public Schools MATHEMATICS CURRICULUM**

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**Learning Targets**

**Content Standards**

**CONTENT STANDARDS LINK:** <http://www.state.nj.us/education/cccs/2016/math/>

<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
<b>S-ID.A.1</b>	Represent data with plots on the real number line (dot plots, histograms, and box plots).
<b>S-ID.A.2</b>	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.
<b>S-ID.A.3</b>	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
<b>S-ID.B.5</b>	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.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How can we use graphs to display real-life data?</li> <li>• How are the measures of central tendency used to predict outcomes of real-life data?</li> <li>• How can we compare different sets of data or different data displays of the same data?</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• Data displays can help them make informed decisions.</li> <li>• Analyzing data by making tables and graphs and looking for patterns of change will guide real world decision making.</li> <li>• Selecting an appropriate model to begin the search for answers or solutions to a question or problem is extremely important.</li> </ul>
<p><b>Unit Objectives</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• How to collect, analyze, and compare different sets of data.</li> <li>• How to display and interpret data using appropriate graphs.</li> <li>• How to display data so it is misleading and not misleading.</li> <li>• How to find the mean, median, mode, and range on collection of data and make predictions.</li> <li>• How to estimate the mean.</li> <li>• How to use graphing calculator to display data appropriately.                             <ul style="list-style-type: none"> <li>• How to select the appropriate measure of central tendency for selected data.</li> </ul> </li> <li>• How to create and analyze scatter plot displays of a two-variable data set.</li> </ul>	<p><b>Unit Objectives</b></p> <p><i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Make real-life decisions based upon educated analysis of information.</li> <li>• Critically read data from tables, charts or graphs.</li> <li>• Determine, for a data set, measures of central tendency, variability, and correlation.</li> <li>• Use the data and their characteristics to draw and support conclusions.</li> <li>• Make predictions based on data, including interpolations and extrapolations.</li> <li>• Employ mathematical models to make inferences and predictions to answer questions and solve problems.</li> </ul>

# Brick Township Public Schools MATHEMATICS CURRICULUM

Grade: 8<sup>th</sup> & 9<sup>th</sup>

Aligned to the New Jersey Student Learning Standards

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY GLOBAL SKILLS

## BRICK TOWNSHIP PUBLIC SCHOOLS

### Evidence of Learning

#### Formative Assessments

- Direct Observations
- DO-NOW
- Class participation
- Exit tickets
- Guided practice
- Independent practice
- Open-Ended Questions
- Whole class and small group discussion
- Writing Prompts
- Journals
- Homework
- Worksheets
- Quizzes
- Self-Assessment
- Online Assignments

#### Summative Assessments

- Chapter/Unit Tests
- Teacher Designed Tests
- Mid/ End Chapter Quizzes
- Unit Projects
- Performance Task
- Post Test
- Final Exam
- Presentations
- Online Assessments
- PARCC (subject) test

#### Modifications (Special Education, ELLs, Gifted and Talented)

##### Special Education:

Follow all IEP modifications and accommodations/504 plans which may include the following:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups

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- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

#### **English Language Learners:**

- Native language text (if available)
- Native language to English dictionaries (if available)
- Use visual aids to assist understanding
- Vocabulary Practice
- Assign a stronger student as a “buddy”
- Modeling
- Small group instruction as needed
- More/less time as appropriate
- Instructional technology as needed/required
- Preferential Seating

#### **Gifted and Talented/Honors:**

- Enrichment/Extension Activities
- Opportunities to provide Peer Tutoring
- Real world application
- Rigorous tasks
- Interest based extension activities
- Differentiated instruction
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use centers, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Small group instruction as needed
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Movement from teacher-directed learning to student-directed learning
- Preferential seating

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### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Textbook (Big Ideas – Algebra 1)
- Graphing Calculator
- Microsoft Excel/PowerPoint
- Textbook and teacher-made tests, worksheets, warm-ups, and quizzes
- Computer software to support unit
- Smart board
- Document Camera
- [www.ixl.com](http://www.ixl.com)
- [www.purplemath.com](http://www.purplemath.com)
- [www.Kutasoftware.com](http://www.Kutasoftware.com)
- [www.Khanacademy.com](http://www.Khanacademy.com)
- [www.brightstorm.com](http://www.brightstorm.com)
- [www.coolmath.com](http://www.coolmath.com)
- [www.desmos.com](http://www.desmos.com)

### Teacher Notes: