

Summit Public Schools
Summit, New Jersey
Grade Level: 9/ Content Area: Mathematics

Overview:

Block Algebra 1 is a two-period “block” course that will cover both Foundations of Algebra and Algebra 1 within a single school year. The course will address the topics listed below, namely solving equations, the study of linear, quadratic, exponential, polynomial, radical, and rational functions, as well as threads of geometry and data analysis.

The course is designed to appeal to students that are interested in mathematics and are motivated to accelerate their high school course of study.

Pacing Guide:

QUARTER 1

Unit 1 – Prerequisites for Algebra

Topic	Time Frame
Operations on Integers	1
Operations on Rational Numbers	2
Variables and Like Terms	1
Distributive Property	1
Simplifying Complex Expressions	3
Data as a Table and Graph	1
Relations vs. Functions	2

Test	1
Total	12

Unit 2 – Solving Linear Equations

Topic	Time Frame
Modeling and Solving Equations with Algebra Tiles	1
Modeling and Solving One-Step Equations	1
Modeling and Solving Two-Step Equations	2
Combining Like Terms to Solve Equations	1
Distributive Property in Equations	1
Solving Equations with Variables on Both Sides	3
Re-writing Equations and Formulas	2
Test	1
Total	12

Unit 3 – Linear Functions

Topic	Time Frame
Graphing Linear Equations by Making a Table	1
Slope	2
Graphing Linear Equations in Slope-Intercept Form	3
Writing Linear Equations in Slope-Intercept Form	2
Test 1	1
Graphing Linear equations in Standard Form	2
Writing Linear Equations in Point-Slope Form	2
Modeling Constant Rates of Change	3
Function Notation	2
Test 2	1
Total	18

QUARTER 2

Unit 4 – Linear Inequalities

Topic	Time Frame
Writing and Graphing 1 Variable Inequalities	1
Solving Inequalities Using Addition and Subtraction	1
Solving Inequalities Using Multiplication and Division	1
Solving Multi-Step Inequalities	3
Solving Compound Inequalities	3
Graphing Linear Inequalities in 2 Variables	3
Test	1
Total	13

Unit 5 – Systems of Linear Equations

Topic	Time Frame
Solving Systems by Graphing	3
Solving Systems by Substitution	3

Solving Systems by Elimination	3
Solving Special Systems of Equations	1
Solving Systems of Linear Inequalities	2
Distance, Rate, and Time Problems	2
Test	1
Total	15

Unit 6 – Exponential Functions

Topic	Time Frame
Properties of Exponents	4
Scientific Notation	1
Graphs of Exponential Functions	3
Applications of Exponential Growth and Decay	3
Test	1
Total	12

Midterm Prep and Exams: 6 days

QUARTER 3

Unit 7 – Polynomials and Factoring

Topic	Time Frame
Adding and Subtracting Polynomials	1
Multiplying a Polynomial by a Monomial	1
Factoring Polynomials – GCF	1
Multiplying Polynomials	1
Factoring Trinomials, where $a = 1$	1
Factoring Trinomials, where $a > 1$	2
Special Factoring Patterns	2
Multistep factoring	2
Solving equations by factoring	2
Test	1

Total	14
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Unit 8 – Graphing Quadratic Functions

Topic	Time Frame
Exploring Quadratic Functions	1
Graphing Quadratic Functions in the Form	2
Graphing Quadratic Functions in the Form	2
Comparing Linear, Exponential, and Quadratic Functions	1
Test	1
Total	7

Unit 9 – Solving Quadratic Equations

Topic	Time Frame
Solving Quadratic Equations by Graphing	1
Solving Quadratic Equations by Factoring	1

Finding and Estimating Square Roots	1
Solving Quadratic Equations by Using Square Roots	1
Solving Quadratic Equations by Completing the Square	2
Solving Quadratic Equations by using the Quadratic Formula	2
Solving Systems of Linear and Quadratic Equations	2
Test	1
Total	11

Unit 10 – Radicals and Square Root Functions

Topic	Time Frame
Properties of Square Roots	3
Graphing Square Root Functions	2
Test	1
Total	6

Unit 11 – Statistics

Topic	Time Frame
Measures of Central Tendency	1
Measures of Dispersion	2
Shapes of Distributions	1
Line Plots and Box & Whisker Plots	2
Scatter Plots and Lines of Best Fit	2
Test	1
Total	9

QUARTER 4

NJSLA Prep and Exam: 10 days

Unit 12 – Rational Functions

Topic	Time Frame
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Inverse variation	2
Graphing rational functions	3
Simplifying rational expressions	2
Multiplying and dividing rational expressions	2
Operations with rational expressions	3
Solving rational equations	2
Test	1
Total	15

Unit 13 – Geometry Preview

Topic	Time Frame
Areas	2
Surface Areas	2
Volumes	3
Pythagorean Theorem and Distance Formula	2

Trigonometric Ratios	3
Test	1
Total	13

Final Exams and Prep: 6 days

Unit 1: Prerequisites for Algebra

Big Ideas: *Course Objectives/ Content Statement(s)*

- Perform operations on integers and rational numbers
- Simplify algebraic expressions
- Express mathematical relations using different representations
- Identify relations that are functions

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- How are operations on signed numbers performed?
- What are variables and how can they be used to represent changing quantities?
- How can data be represented as a graph, table, or expression?
- What is a function?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- The order of operations apply to both numeric and variable expressions.
- Independent and dependent variables can be used to algebraically relate two changing quantities to each other.
- Mathematical relationships can be modeled with four different representations: verbal, algebraic, tabular, and graphic.
- A function is a type of relationship where every input generates a single output.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)

Students will:

- (N-RN-3) Use properties of rational and irrational numbers.
- (A-SSE-1) Interpret expressions that represent a quantity in terms of its context.
- (A-CED-2) Use the structure of an expression to identify ways to rewrite it.
- (F-IF-1) Understand that a function from one set to another set assigns each element of the domain exactly one element of the range.
- (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

Lessons

1. Simplify numeric expressions using order of operations.
2. Add and subtract signed rational numbers.
3. Multiply and divide signed rational numbers.
4. Simplify variable expressions by using the distributive property and combining like terms.
5. Represent data graphically and in a table.
6. Define and identify a function.

description of the relationship. • (F-IF-5) Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	
Differentiation	Assessments
Interdisciplinary Connections • Students can write equations or functions to model real-world systems. Technology Integration • Students can use online graphing technology such as Desmos.com to easily create tables and graphs. Media Literacy Integration • Students can identify misleading graphs based on changing the scales on each axis, with the aid of technology.	Sample Assessments - Find the value of the following in lowest terms where appropriate: $-2 - 7 + 5$ $\frac{1/3 - 1/4}{2/3}$ - Use variables to create an equation representing the following scenario: “My father is 2 years less

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triads or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

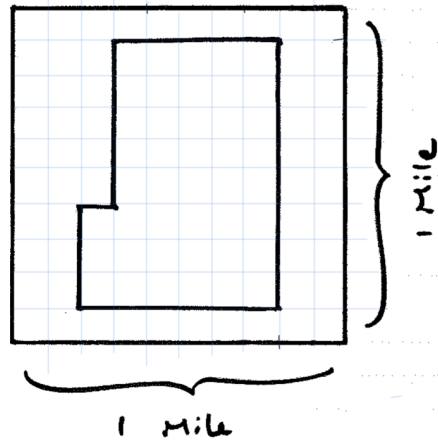
Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g.	Differentiated materials

than triple my age.”

- Write the following data in a table, assign a variable to each quantity. Then, create a reasonable graph to plot the data points on.

It costs \$2.25 to fax ten pages and \$1.65 to fax 6 pages.

4.



Find the area and perimeter of the building inside of the 1 square mile shape above. Show all work

a. AREA:

b. PERIMETER:

- Explain why the assignment of Social Security Numbers is a function.

	directions, checks for understanding, feedback		
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 2: Solving Linear Equations

Big Ideas: *Course Objectives/ Content Statement(s)*

- Understand solving equations as a process of reasoning and explain the reasoning
- Solve linear equations in one and two variables
- Use proportions to solve problems

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- How can we utilize equations to solve problems?
- How can Algebra Skills be used in solving real world problems?
- Can equations that appear to be different be equivalent?
- Can I analyze, model, and solve mathematical situations using algebraic symbols?

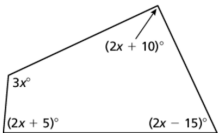
Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- To obtain a solution to an equation, no matter how complex, always involves the process of undoing operations.
- Proportionality involves a relationship in which the ratio of two quantities remains constant as the corresponding values of the quantities change.
- Real world situations can be modeled and solved by using equations.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: • (A-CED-1) Create equations in one variable and use them to solve problems. • (A-CED-2) Create equations in two or more variables to represent relationships between quantities. • (A-CED-3) Represent constraints by equations and systems of equations, and interpret solutions as viable or nonviable options in a modeling context. • (A-REI-2) Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. • (A-REI-3) Solve linear equations in one variable, including equations with coefficients represented by letters. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity.	1. Solve linear equations with rational number coefficients. 2. Solve linear equations whose solutions require expanding expressions using the distributive property. 3. Solve linear equations whose solutions require collecting like terms, including variables on both sides. 4. Solve absolute value equations. 5. Solve literal equations for a particular variable.

CRP12: Work productively in teams while using cultural global competence.															
Differentiation			Assessments												
Interdisciplinary Connections - Real world situations can be modeled and solved by using equations and crossover to Language Arts and Technology. - Literal equations from physics and chemistry will be used as examples.			Sample Assessments - Solve $x + 6 = -3$ - Solve $7x + 2 = -54$ - Solve $11 + 3x - 7 = 6x + 5 - 3x$ - Solve $9 = 3(5x - 2)$ - Solve $7x - 3y = 8$ for y. - Give a value of c for which the equation $x + 4 = x + c$ has no solution. Explain - Find the sum of the angles in the polygon using the formula $S = 180(n - 1)$ - Write an equation for the sum of the angles. - Solve for x by showing all of your work. - Find all of the missing angles.  - Flight 101 flies from Dallas to New York at 600 mi/hr. An hour later, Flight 102 leaves from New York to Dallas at 500 mi/hr. If New York and Dallas are about 1,700 miles apart, how long will it take until they pass each other? <table border="1"> <thead> <tr> <th></th><th>Rate</th><th>Time</th><th>Distance</th></tr> </thead> <tbody> <tr> <td>Flight 101</td><td></td><td>t</td><td></td></tr> <tr> <td>Flight 102</td><td></td><td></td><td></td></tr> </tbody> </table> - Solve $m + 4 = 8$ - Solve for y: $3x + 2y = 12$		Rate	Time	Distance	Flight 101		t		Flight 102			
	Rate	Time	Distance												
Flight 101		t													
Flight 102															
Technology Integration Students can utilize online resources, watch Khan Academy videos and generate models with Smart Software.															
Media Literacy Integration Students can use online resources to generate practice problems for further understanding.															
Global Perspectives Students will work with real world problems that involve percentages, percent change and profit-and-loss scenarios.															
Supports for English Language Learners															
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Magazines & Newspapers	Timelines	Structures																		
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Models & Figures																				
<table border="1"> <thead> <tr> <th colspan="3">Intervention Strategies</th></tr> <tr> <th>Accommodations</th><th>Interventions</th><th>Modifications</th></tr> </thead> <tbody> <tr> <td>Allow for verbal responses</td><td>Multi-sensory techniques</td><td>Modified tasks/expectations</td></tr> <tr> <td>Repeat/confirm directions</td><td>Increase task structure (e.g. directions, checks for understanding, feedback)</td><td>Differentiated materials</td></tr> <tr> <td>Permit response provided via computer or electronic device</td><td>Increase opportunities to engage in active academic responding</td><td>Individualized assessment tools based on student need</td></tr> <tr> <td>Audio Books</td><td>Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping</td><td>Modified assessment grading</td></tr> </tbody> </table>			Intervention Strategies			Accommodations	Interventions	Modifications	Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations	Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback)	Differentiated materials	Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading
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Unit 3: Linear Functions

Big Ideas: *Course Objectives/ Content Statement(s)*

- Understand and be able to explain the concept of slope and how it relates to linear functions.
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- Graph linear functions given in a variety of forms.
- Write the equation of a linear function given facts, a graph, a table, or a combination.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- What is a rate of change and how is it measured?
- What information does the equation of a line give you?
- How are equations and graphs related?
- What types of real-world relationships can be modeled with linear functions?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- A rate of change can be interpreted as the slope between two points. Linear functions have a constant slope between any two points.
- The equation of a line gives all the points along that relationship as well as the slope of the line.
- The relationship between two lines can be determined by comparing their slopes and y-intercepts.
- Linear functions can model any relationship between two quantities with a constant rate of change.

**Areas of Focus: Proficiencies
(New Jersey Student Learning Standards)**

Students will:

- (F-IF-1) Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range.
- (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.
- (F-IF-4) 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.
- (F-IF-5) Relate the domain of a function to its graph and, where applicable, to the quantitative

Lessons

1. Understand that solutions to two-variable equations can be modeled by ordered pairs.
2. Find the slope between pairs of points on linear functions.
3. Graph linear functions in standard form and find their slope.
4. Graph linear functions in slope-intercept form.
5. Graph and interpret the slope and y-intercept of linear functions using function notation.
6. Given points and/or a slope, write the equation of a line in slope-intercept form.
7. Given points and/or a slope, write the equation of a line in point-slope form.
8. Determine if lines are parallel, perpendicular, or neither.

relationship it describes Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	9. Plot data on a scatterplot and find the line of best fit.
Differentiation	Assessments
Interdisciplinary Connections - Students can write equations or functions to model real-world systems. Technology Integration - Students can use online graphing technology such as Desmos.com to easily create tables and graphs. Media Literacy Integration - Students can change the slopes and y-intercepts of graphs, with the aid of technology. Global Perspectives	Sample Assessments 1. For each equation below: Is (2, 5) is a solution? a. $4x - y = 3$ b. $y = x^2 + 1$ c. $xy = y - x$ 2.

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triands or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g.	Differentiated materials

For each equation or table below: Is the relation “LINEAR” or “NOT LINEAR”? Write a sentence to explain each.

a. Table

X	Y
-1	5
0	6
1	8

- Graph this line using the slope and y-intercept. $y = 2x - 6$
- Write an equation of the line with slope $m = 2/3$ which crosses the y -axis at $(0, -1/3)$
- Rewrite $y = 3x + 5$ in standard form.
- Write an equation of the line which passes through $(3, 4)$ and has slope $m = 5$.
- Write the equation of a line in point-slope form given $(2, 4)$ and $(-3, 6)$
-

Let $h(t) = -5t + 90$ represent the temperature of a hot cup of tea cooling in a freezer, measured in degrees Celsius after t minutes.

- Write a sentence to describe what $h(1) = 85$ means.
- Write a sentence to describe what $h(3) > h(8)$ means.
- Evaluate $h(t)$ when $t = 0, 5$, and 10 .
- What is the slope of the line? What are the units on the slope?

	directions, checks for understanding, feedback		
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	

Recommended Texts to Support Unit:

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Unit 4: Linear Inequalities	
Big Ideas: <i>Course Objectives/ Content Statement(s)</i> • Represent inequalities on a number line. • Solve linear inequalities in one variable. • Represent and solve linear inequalities in two variables graphically.	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
• How do you represent relationships between quantities that are not equal? • Can inequalities that appear to be different be equivalent? • How can inequalities be used to represent relationships and solve problems? • How can a range of values be represented using absolute value inequalities?	Students will understand that: • Real world situations can be modeled and solved by using equations and inequalities. • The characteristics of linear inequalities and their representations are useful in solving real-world problems. • Systems of linear equations and/or inequalities are used to model and solve real-world problems involving two variables. • Absolute value inequalities are special types of compound inequalities.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: • (A-CED-1) Create linear inequalities in one variable and use them to solve problems. • (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. • (A-REI-3) Solve linear inequalities in one variable. • (A-REI-12) Graph the solutions to a linear inequality in two variables. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	1. Solve one-step inequalities in one variable. 2. Solve one variable inequalities in multi-step problems. 3. Understand, graph, and solve compound inequalities. 4. Solve absolute value inequalities. 5. Graph and interpret two-variable linear inequalities.
Differentiation	Assessments
Interdisciplinary Connections • Students can write inequalities to model real-world systems.	Sample Assessments 1. Solve this inequality: $x + 2 > 12$

Technology Integration

- Students can use online graphing technology such as Desmos.com to easily create tables and graphs.

Media Literacy Integration

- Students can identify the solutions and changes with inequalities by changing the signs.

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triads or small groups
Pictures	Tables	In a whole group
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2. Solve this inequality: $5x - 1 > 5x + 3$

3. Solve this inequality: $x - 1 < 5$ and $x + 4 \geq 0$

4. Solve this inequality: $|x + 7| > 12$

5. The average “passing” score on the state algebra exam is 240. Scores that are no more than 40 points from the average are considered passing. Nick passed the test, but I wasn’t given his score. If N represents Nick’s score, write an absolute value inequality that represents what Nick’s score could have been.

6. Graph $y - 2x < 2$

7. You can download either apps or songs on your phone. Apps cost \$5 each, and songs cost \$2 each. You have a \$20 gift card, so you can spend at most \$20 on both. Write a linear inequality representing how much total money you can spend on songs and apps. Write what x and y represent. Can you buy 6 songs and 3 apps? Use your graph to explain with a sentence or two.

Intervention Strategies		
Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 5: Systems of Linear Equations	
Big Ideas: <i>Course Objectives/ Content Statement(s)</i> • Solve systems of linear equations exactly and approximately (i.e. graphs) • Prove that solutions to a system of linear equations in two variables satisfies both equations simultaneously. • Graph solutions and solve simple systems by inspection. • Write and solve systems of linear equations in two variables.	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>

• What does the number of solutions (none, one or infinite) of a system of linear equations represent? • What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically? • How can systems of equations be used to represent situations and solve problems?	Students will understand that: • The solution(s) to a system can be represented as the ordered pairs in the coordinate plane where the plots of the equations intersect. • Systems of equations can be solved by graphing, substitution, or eliminating a variable. • Systems of linear equations can be used to model problems with two unknowns constrained under two conditions (equations).
Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: • (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. • (A-REI-6) Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity.	1. Understand what the solution of a system represents numerically and graphically. 2. Find the solution to a system by the method of substitution. 3. Find the solution to a system by the method of elimination. 4. Solve “special” systems of equations, where solutions are potentially infinite or non-existent.

CRP12: Work productively in teams while using cultural global competence.

Differentiation

Interdisciplinary Connections

- Students can write systems of equations to model real-world and break even problems.

Technology Integration

- Students can use online graphing technology such as Desmos.com to easily create tables and graphs.

Media Literacy Integration

- Students can identify and interpret the solution to a system faster with the aid of technology.

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Assessments

Sample Assessments

- Explain why (1,3) is a solution to the system:

$$x + y = 4$$

$$2y - 3x = 3$$

- Solve the system by graphing.

$$2x - 3y = -2$$

$$4x + y = 24$$

- Solve the following system by substitution.

$$2x - 3y = -2$$

$$4x + y = 24$$

- Solve the following system using elimination..

$$2x + y = 9$$

$$3x - y = 16$$

- Margo began her workout by walking 4 miles and then she rode her bike for 20 miles. The total time for her workout was 3 hours. Find her speed on the bike if she rode her bike 9 miles per hour faster than she walked.

- Football has two types of kicks: Field goals and extra points. A kicker made a total of 30 field goals and extra points. A field goal is worth 3 points and an extra point is worth 1 point. The kicker scored a total of 60 points. How many field goals and extra points did he make? Solve by writing and solving a system. Confirm with a graph.

- A farmer plants corn and soybeans. Each acre of corn costs \$6 to maintain and each acre of soybeans costs \$12 to maintain. The farmer needs at least 50 acres of crops but can spend no more than \$2400 to maintain the crops. How many acres of each can he plant? Represent your answer as a shaded region in the coordinate plane.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triands or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software

		support																		
Videos & Film		In the home language																		
Broadcasts		With mentors																		
Models & Figures																				
<table border="1"> <thead> <tr> <th colspan="3">Intervention Strategies</th></tr> <tr> <th>Accommodations</th><th>Interventions</th><th>Modifications</th></tr> </thead> <tbody> <tr> <td>Allow for verbal responses</td><td>Multi-sensory techniques</td><td>Modified tasks/expectations</td></tr> <tr> <td>Repeat/confirm directions</td><td>Increase task structure (e.g. directions, checks for understanding, feedback)</td><td>Differentiated materials</td></tr> <tr> <td>Permit response provided via computer or electronic device</td><td>Increase opportunities to engage in active academic responding</td><td>Individualized assessment tools based on student need</td></tr> <tr> <td>Audio Books</td><td>Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping</td><td>Modified assessment grading</td></tr> </tbody> </table>			Intervention Strategies			Accommodations	Interventions	Modifications	Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations	Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback)	Differentiated materials	Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading
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Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 6: Exponential Functions

Big Ideas: *Course Objectives/ Content Statement(s)*

- Re-write or simplify expressions with positive and negative rational exponents.
- Graph and categorize exponential functions.

- Use exponential functions and their graphs to solve applied problems in growth and decay.
- Apply transformations to “parent” exponential functions.

Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
● How can you simplify expressions involving exponents? ● What characterizes exponential growth versus decay versus linear growth? ● How can exponential growth be modeled by equations and/or graphs? ● What is a transformation? How can transformed exponential functions be represented algebraically?	Students will understand that: ● Exponent rules for products, quotients, and powers can be used to re-write expressions with positive and negative exponents. ● Exponential growth is a pattern in multiplication while linear growth is a pattern in addition. ● By using the initial value and exponential growth rate an equation can be used to model an exponential scenario. ● Graphs of “parent” functions can be transformed by translating (shifting), dilating (stretching), and reflecting. These changes can be represented as changes in the model’s equation.
Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: ● (F-LE-1) Prove exponential functions grow by equal factors over equal intervals. ● (F-LE-3) Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly. ● (CED-1) Create equations and inequalities in one variable and use them to solve problems. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with	1. Simplifying Exponential Expressions 2. The Exponential Function 3. Applications for Exponential Growth and Decay 4. Graphs and Transformations of Exponential Functions

reason.

CRP5: Consider the environmental, social and economic impacts of decisions.

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.

CRP9: Model integrity, ethical leadership and effective management.

CRP10: Plan education and career paths aligned to personal goals.

CRP11: Use technology to enhance productivity.

CRP12: Work productively in teams while using cultural global competence.

Differentiation

Interdisciplinary Connections

- Students can write exponential functions to model real-world growth and decay systems.

Technology Integration

- Students can use online graphing technology such as Desmos.com to easily create tables and graphs.

Media Literacy Integration

- Students can identify changes in graphs based on changing the power of the exponential function.

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

Sensory Supports

Graphic Supports

Interactive Supports

Assessments

Sample Assessments

1. Simplify the expressions:

1. $\frac{2^{-3}x^0}{y^{-4}}$

2. 3^0

3. $5^{-6} \cdot 5^3$

4. $(-4x^2)^3$

5. $\left(\frac{1}{3a^3}\right)^{-4}$

6. $12c^{-7}d^6$

2. Is the function linear or exponential? Then, find the appropriate model.

x	y
0	5
1	10
2	20
3	40

3. You buy a used car for \$6,599. Its value decreases by 12% every year.

- Find an exponential model for the car's value after x years.
- Explain why your answer is a decay

Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triads or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading

function.

- c. What will the car's value be after 10 years?
 - d. According to your model will the car ever reach a value of \$0? Explain and interpret.
4. Graph the exponential function by hand using 5 points:
 - a. $y = 2^{-x}$
 - b. $y = -2^x$
 - c. $y = 1/2^x$
 5. Compare the function below to the parent function. Explain the relationship in terms of transformations.

$$y = 2(1/3)^x - 5$$

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 7: Polynomials and Factoring

Big Ideas: Course Objectives/ Content Statement(s)

- Students will perform operations of addition, subtraction, and multiplication on polynomials.
- Students will understand the difference between expanded form and factored form of polynomials.
- Students will fully factor polynomials using a variety of techniques.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- How can polynomials be added or subtracted?
- What are the different methods to multiply polynomials?
- What is the difference between factoring and multiplying?
- How can students identify what factoring method to use for a given polynomial?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- Polynomials' "like terms" can be combined
- Polynomials are multiplied using the distributive property. Tricks such as the "table method" or "FOIL" can expedite the process.
- Factoring is to write an expression as a product.
- The degree, number of terms, and coefficients can help identify what factoring method to use.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)

Students will:

- (A-SSE-1) Interpret expressions that represent a quantity in terms of its context
- (A-SSE-2) Use the structure of an expression to identify ways to rewrite it.exceeds a quantity increasing linearly.
- (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-APR-1) Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition,

Lessons

1. Add and Subtract Polynomials
2. Multiply Polynomials
3. Special Products of Polynomials (Difference of Squares and Binomial Squared)
4. GCF Factoring
5. Guess and Check Factoring
6. Factor by Grouping
7. British Factoring Method

subtraction, and multiplication; add, subtract, and multiply polynomials. • (A-APR-4) Prove polynomial identities and use them to describe numerical relationships. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	8. Difference of Squares and Factoring Special Products
Differentiation	Assessments
Interdisciplinary Connections • Problems involving geometry will be used in the study of polynomials. Technology Integration • Students can use online graphing technology such as Desmos.com to easily create tables and graphs. Global Perspectives • Students will work with real-world data, where available and appropriate, from the social and physical sciences.	Sample Assessments 1. Simplify: $(2x^3 + 3x^2 - 7x) - (5x^3 - 4x)$ $3x^2y(2xy - 5y^3)$ $(x - 4)(x + 5)$ 2. Factor completely over the integers: $15x^2 - 5x + 20x^3$ $x^2 - x - 12$ $2x^2 - 3x - 9$ $3x^2 - 75$

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triands or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need

3. Solve:

a. $3x^3 - 3x^2 - 36x = 0$

b. $x^2 - 10 = -3x$

c. $x^3 + 3x^2 - 4x - 12 = 0$

4. The length and width of a patio are $(x+3)$ ft. and $(x+7)$ ft. respectively. If the area of the patio is 1344 square feet, find the length and width.

Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	
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Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 8: Graphing Quadratic Functions

Big Ideas: Course Objectives/ Content Statement(s)

- Students will graph quadratic functions in standard and vertex form.
- Students will use quadratic functions to model real-world scenarios.
- Students will use features of quadratic functions to answer questions about maxima, minima, and intercepts.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- What are the properties of a parabola?
- How can changing the parameters in the standard form of a quadratic equation affect the shape, direction, and range of the graph?
- How are linear, exponential, and quadratic functions different?
- What are the advantages and disadvantages of standard and vertex forms of a quadratic function?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- A parabola is the graph of a quadratic function. It has a restricted range with a minimum or maximum.
- Changing a, b, or c in the above standard form will affect the location of the vertex, the direction that the parabola opens, and the width of the curve.
- Quadratic functions are not monotone, and thus have extrema, unlike linear and exponential functions.
- Standard form easily identifies the direction, width, and y-intercept of a parabola, while vertex form easily identifies the parabola's vertex.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: • (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. • (F-IF-7a) Graph quadratic functions and show intercepts, maxima, and minima. • (F-IF-8a) 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. • (F-IF-9) Compare properties of two functions each represented a different way. • (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; find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity.	1. Graphing $y = ax^2$ 2. Graphing $y = ax^2 + c$ 3. Graphing in Standard Form 4. Finding Max and Min Values in Word Problems 5. Graphing in Vertex Form

CRP12: Work productively in teams while using cultural global competence.

Differentiation

Interdisciplinary Connections

- Applications to physics include projectile motion and real world situations.

Technology Integration

- Students can use online graphing technology such as Desmos.com to easily create tables and graphs.

Media Literacy Integration

- Students can analyze different views of graphs and explain their format based on the intentions of the publisher or creator.

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

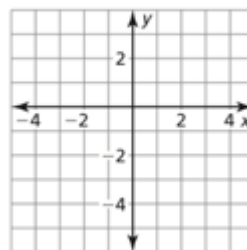
Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triands or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines &	Timelines	Structures

Assessments

Sample Assessments

- Create a table and plot $y = x^2$. Use the table to explain why the function cannot be linear or exponential.
- Create a table and plot each. Identify zeros, vertex, domain, and range.
 - $y = -x^2$
 - $y = -x^2 + 4$
- Find the vertex of: $y = -x^2 + 3x + 4$
- List the transformations from the parent and sketch a graph:

$$h(x) = -\frac{1}{3}x^2$$



10.

Tell whether the table below is a **LINEAR, EXPONENTIAL, OR QUADRATIC** function. Show work and explain.

3.

x	-2	-1	0	1	2
f(x)	5	3	1	-1	-3

- Find the intervals on which the quadratic function is increasing and decreasing:

$$g(x) = -3x^2 + 12x$$

- Write an equation of a quadratic function that has

Newspapers		
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies		
Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading

a vertex at (3, 8) and contains the point (1, 0).

13. A toy rocket is launched from a platform into the air. Its height after t seconds is given by the function: $h(t) = -16t^2 + 96t + 3$

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 9: Solving Quadratic Equations

Big Ideas: *Course Objectives/ Content Statement(s)*

- Students will solve quadratic equations using a variety of methods.
- Students will interpret the solutions of quadratic equations as features of graphs or meaningful moments in a real-world scenario.
- Students will identify the number of solutions of a quadratic equation.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- What is the connection between the zeros of a quadratic function and the solutions to a quadratic equation?
- What are the different ways in which quadratic equations can be solved?
- When should each method of solving quadratics be used?
- How can systems of linear and quadratic equations be solved?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- The solutions to a quadratic equation are the same as the zeros of the corresponding quadratic function.
- Quadratic equations can be solved by graphing, factoring, completing the square, taking a square root, or the quadratic formula.
- The nature of the coefficients of the quadratic equation will determine the most appropriate method of solving it.
- Systems involving linear and quadratic equations are best solved by substitution or graphing, depending on the given information.

**Areas of Focus: Proficiencies
(New Jersey Student Learning Standards)**

Students will:

- (N-CN-7) Solve quadratic equations with real coefficients that have complex solutions.
- (A-SSE-3a) Factor a quadratic expression to reveal the zeros of the function it defines.
- (A-SSE-3b) Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- (A-REI-4a) Use the method of completing the square to transform any quadratic equation in x into the form $(x-p)^2=q$ that has the same solutions. Derive the quadratic formula from this form.
- (A-REI-4b) Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation.

Lessons

14. Solving Quadratics Using Square Roots
15. Solving Quadratics Using the Zero Products Property
16. Solving Quadratics Using the Quadratic Formula
17. Solving Systems of Linear and Quadratic Functions
18. Solve Quadratics Using Completing the Square

Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	
Differentiation	Assessments
Interdisciplinary Connections - Students can analyze projectile motion using a quadratic model, and identify features such as the projectile's maximum height and how long it is in the air for. Technology Integration - Students can use online graphing technology such as Desmos.com to easily create tables and graphs. Global Perspectives - Students will work with real-world data, where available and appropriate, from the social and physical sciences.	Sample Assessments 19. Solve the quadratic by graphing it and finding the zeros. 20. Solve the quadratic equation by using the most appropriate method: $3x^2 - 27 = 0$ $2x^2 - 3x - 9 = 0$ $-4x^2 - 2 = 7x$ 21. Graph the quadratic $y = x^2 - 4x + 1$ by first completing the square and re-writing the function in "vertex form". Identify the minimum or maximum value. Then, find the zeros by the most appropriate method. 22. Create a quadratic equation for which solving by

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triads or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need

completing the square would be a POOR choice. Explain.

23. Create a quadratic equation for which solving by the square root method would be a POOR choice. Explain.

24. Solve the system of equations by substitution:

$$y = 2x^2 - 4x + 1$$

$$y = 8x - 17$$

Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	
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Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 10: Radicals and Square Root Functions

Big Ideas: *Course Objectives/ Content Statement(s)*

- Students will simplify, add, subtract, multiply, and divide radicals.
- Students will learn how to graph square root and cubed root functions.
- Students will solve simple radical equations in one variable and give examples showing how extraneous solutions may arise.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- What are perfect squares and perfect cubes?
- What constitutes a simplified radical expression?
- How does adding or subtracting radicals differ from multiplying or dividing radicals?
- What is the difference between the graphs of square root and cubed root functions?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- Perfect squares and cubes are the values of powers of 2 and 3 of the integers.
- A simplified radical does not contain a factor that's a perfect square.
- Adding and subtracting radicals require like terms, much like polynomials. Radicals might first need to be simplified for like terms to arise.
- Square root functions have a restricted domain while cubed root functions have a domain of all real numbers.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: • (A-REI-2) Solve simple radical equations in one variable, and give examples showing how extraneous solutions may arise. • (F-IF-7b) Graph square root functions. • (F-IF-9) Compare properties of two functions each represented in a different way. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	25. Simplifying Radicals 26. Adding and Subtracting Radicals 27. Graphing Square Root Functions 28. Graphing Cubed Root Functions 29. Transformations of Root Functions 30. Solve Square Root Equations
Differentiation	Assessments
Interdisciplinary Connections • Radicals are used in many real-life applications. Some of these include velocity, frequency, energy, right triangle applications, densities and fluid flow through a membrane.	Sample Assessments 31. Simplify: a. $\sqrt{27}$ b. $\frac{\sqrt{288}}{\sqrt{8}}$

Technology Integration

- Students can use online graphing technology such as Desmos.com to easily create tables and graphs.

Global Perspectives

- Students will work with real-world data, where available and appropriate, from the social and physical sciences.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triands or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
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- c. $\sqrt{15} \cdot \sqrt{5}$
d. $\frac{\sqrt{7}}{\sqrt{3}}$
e. $\sqrt{125} - 3\sqrt{5}$

32. Solve the equation:

- a. $\sqrt{x} + 4 = 12$
b. $\sqrt{10x - 3} = \sqrt{5x + 2}$
c. $x = \sqrt{x + 4} - 2$

33. How does the graph of $y = 1/2\sqrt{x} - 4$ compare to the graph of $y = \sqrt{x}$?

34. Graph $y = \sqrt{x + 7}$. State the domain and range.

Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations	
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback	Differentiated materials	
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 11: Statistics	
Big Ideas: <i>Course Objectives/ Content Statement(s)</i> ● Students will summarize, represent, and interpret data on a single count or measurement variable. ● Students will summarize, represent, and interpret data on two categorical and quantitative variables.	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
● How can different data displays affect analyses of the data? ● What does a correlation between two variables mean? ● How can predictions be made using data?	Students will understand that: ● Based on context, one data display (graph) may be more appropriate than another to illustrate a data's distribution. ● Histogram, dot plots, line plots, or box and whisker plots can be used to display data. ● If bivariate data show a linear relationship, there can be either a positive or negative correlation. Also, with a linear relationship, a line of best fit can be determined and drawn.

	● Univariate data can follow a uniform, normal, or skewed distribution curve. ● Predictions can be based on previously collected data or by performing experiments. Computing expected value can also help in decision-making.
Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: ● (S-ID-1) Represent data with plots on the real number line (dot plots, histograms, and box plots). ● (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. ● (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). ● (S-ID-6) Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ● (S-ID-7) Interpret the slope and the intercept of a linear model in the context of the data. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. CRP6: Demonstrate creativity and innovation. CRP7: Employ valid and reliable research strategies. CRP8: Utilize critical thinking to make sense of problems	35. Construct Plots: Histogram, Line, Dot, Box and Whisker 36. Measures of Central Tendency and Variation 37. The Normal Distribution and the 68/95/99.7 Rule 38. Construct Scatter Plots 39. Find and Analyze Lines of Best Fit

and persevere in solving them.

CRP9: Model integrity, ethical leadership and effective management.

CRP10: Plan education and career paths aligned to personal goals.

CRP11: Use technology to enhance productivity.

CRP12: Work productively in teams while using cultural global competence.

Differentiation	Assessments						
Interdisciplinary Connections - Real data from physics, chemistry, and the social sciences will be used in class analysis. Technology Integration - Students will use the random integer generator on the graphing calculator to run simulations and make predictions. - Students will enter and plot data on Google Sheets. Media Literacy Integration - Students can explore specific statistics presented in national news reports to examine and discuss potential sources of bias. Global Perspectives - Students can gather real-world data about populations from citizens of different nations, and use graphs and measures of central tendency to compare the distributions.	Sample Assessments: - Seven students were asked to record the number of hours spent using the internet per week. The hours were {5, 9, 8, 9, 7, 9, 16}. - Create a line plot as well as a box and whisker plot for the data. - Compute and interpret the difference between the mean and median of the data. - Compute and interpret the standard deviation of this data. - Describe a set of data that would show a negative correlation. Include a sketch of the graph of the data with a possible line of best fit. - In the third quarter, Chris’s test average was 84%, quiz average 92%, and classwork 94%. If tests are weighted 60%, quizzes 30%, and classwork 10%, compute Chris’s final average for the third quarter. - A shoe manufacturer wants to check the quality of its shoes. Every hour, 20 pairs of shoes are taken off the assembly line and checked. Is this sample biased or unbiased?						
<table><tr><th colspan="3">Supports for English Language Learners</th></tr><tr><td>Sensory Supports</td><td>Graphic Supports</td><td>Interactive Supports</td></tr></table>		Supports for English Language Learners			Sensory Supports	Graphic Supports	Interactive Supports
Supports for English Language Learners							
Sensory Supports	Graphic Supports	Interactive Supports					

Real-life objects	Charts	In pairs or partners
Manipulatives	Graphic Organizers	In triads or small groups
Pictures	Tables	In a whole group
Illustrations, diagrams & drawings	Graphs	Using cooperative group
Magazines & Newspapers	Timelines	Structures
Physical activities	Number lines	Internet / Software support
Videos & Film		In the home language
Broadcasts		With mentors
Models & Figures		

Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm directions	Increase task structure (e.g. directions, checks for understanding, feedback	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 12: Rational Functions

Big Ideas: Course Objectives/ Content Statement(s)

- Students will rewrite rational expressions.
- Students will understand solving rational equations as a process of reasoning and explain the reasoning.
- Students will analyze rational functions and their transformations.

Essential Questions

What provocative questions will foster inquiry, understanding, and transfer of learning?

- How do properties of rational numbers apply to variable rational functions?
- How does a variable in the denominator of a function affect the domain of the function and the properties of the function's graph?
- How can rational equations be solved?

Enduring Understandings

What will students understand about the big ideas?

Students will understand that:

- The procedures in dealing with denominators with rational numbers can be applied to variable expressions when adding, subtracting, multiplying, or dividing.
- A variable in the denominator of a function creates a value(s) at which the function is undefined. This can create a variety of different behaviors around the domain error.
- The process of "clearing the denominators" will provide solutions, some of which can be extraneous.

Areas of Focus: Proficiencies (New Jersey Student Learning Standards)

Students will:

- (A-APR-D6) rewrite simple rational expressions in different forms.
- (A-APR-D7) understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Lessons

5. Compare Inverse and Direct Variation
6. Simplify Rational Expressions
7. Add, Subtract, Multiply, and Divide Rational Expressions
8. Solve Rational Equations
9. Graph Rational Functions

• (A-REI-A2) solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise. • (A-REI-D11) explain why the x-coordinates of the points where the graphs of equations intersect are the solutions of the equation. • (F-IF-C7-d) graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	
Differentiation	Assessments
Interdisciplinary Connections • Students will examine the direct and inverse relationships that occur in the physical sciences, such as distance/rate/time, the ideal gas law, and Ohm's law.	Sample Assessments: 1. Simplify the following: a. $\frac{3x^2y^4}{27xy^8}$ b. $\frac{2}{x} - \frac{x}{x-1}$

Technology Integration

- Students can use online graphing technology such as desmos.com to easily create tables and graphs.

Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
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Intervention Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/expectations
Repeat/confirm	Increase task	Differentiated

c. $\frac{x^2-4}{x^2-3x-4} \cdot \frac{x-4}{x^2-16}$

2. Solve for x:

a. $\frac{2}{x} = \frac{x+1}{3}$

b. $\frac{1}{x+3} - \frac{x}{x-3} = \frac{2}{x}$

3. Graph the following functions. Include the domain and range:

a. $f(x) = \frac{4}{x}$

b. $f(x) = \frac{1}{x^2}$

c. $f(x) = \frac{x+6}{x-2}$

directions	structure (e.g. directions, checks for understanding, feedback	materials	
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding	Individualized assessment tools based on student need	
Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	

Recommended Texts to Support Unit:

- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015

Unit 13: Geometry Preview	
Big Ideas: <i>Course Objectives/ Content Statement(s)</i> • Students will define trigonometric ratios and solve problems involving right triangles. • Students will use coordinates to prove simple geometric theorems algebraically. • Students will explain volume formulas and use them to solve problems. • Students will visualize relationships between two-dimensional and three-dimensional objects.	
Essential Questions <i>What provocative questions will foster inquiry, understanding, and transfer of learning?</i>	Enduring Understandings <i>What will students understand about the big ideas?</i>
• What is the relationship between area, surface area, and volume? • What is similarity as opposed to congruence?	Students will understand that: • In many cases, students can use what they know about area to solve problems involving complicated areas, surface areas, and volumes.

What is trigonometry?	- Two figures are congruent if they have identical dimensions, while they are similar if their dimensions are proportional. - Trigonometry is the application of the proportionality of sides from similar right triangles.
Areas of Focus: Proficiencies (New Jersey Student Learning Standards)	Lessons
Students will: (G-SRT-A2) given two figures, use the definition of similarity in terms of similar transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. (G-SRT-C6) understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (G-GPE-B7) use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. (G-GMD-A1) give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. (G-GMD-A3) use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. Career-Ready Practices CRP1: Act as a responsible and contributing citizen and employee. CRP2: Apply appropriate academic and technical skills. CRP3: Attend to personal health and financial well-being. CRP4: Communicate clearly and effectively and with reason. CRP5: Consider the environmental, social and economic	- Areas - Surface Areas - Volumes - Pythagorean Theorem and Distance Formula - Trigonometric Ratios

impacts of decisions. 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. CRP9: Model integrity, ethical leadership and effective management. CRP10: Plan education and career paths aligned to personal goals. CRP11: Use technology to enhance productivity. CRP12: Work productively in teams while using cultural global competence.	
Differentiation	Assessments
Interdisciplinary Connections - The Pythagorean Theorem is used in many real-life careers. Some of these include architects, surveyors, engineers, and carpenters. Technology Integration - Students will use a Desmos app to explore a Pythagorean Theorem “proof without words” : https://teacher.desmos.com/activitybuilder/custom/5adc7bfced2ada678516940e?collections=5d091c6f5c42e11a7546874f Media Literacy Integration - Students will create triangles with adjustable dimensions on geogebra.org. The effect of these dimensions on the trigonometric ratios will be observed. Global Perspectives - Students will learn that ancient Babylonians and Egyptians used the Pythagorean Theorem and discuss why this theorem is credited to Pythagoras.	Sample Assessments: - Given the right triangle has sides 10 and 10. What is the length of the hypotenuse? What is the value of the sine, cosine, and tangent of the triangle’s angle? - Given the $AB = 6$, $BC = 8$ and $AC = 10$, find tangent A, sine A, cosine A. - Can each of the three numbers represent the lengths of the sides of a right triangle? Explain your answers. 2, 3, 4 7, 12, 4 - On a baseball diamond, the distance between each of the consecutive bases is 90 feet. How far does the catcher have to throw the ball from home plate to 2nd base? - You need to put a fence around your rectangular pool and the outside cement. You are fencing an area that is 20 by 25 feet. How much material do you need for the fence? - Find the volume of a prism with a height of 15,

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whose base is a parallelogram whose sides are 10, 10, 8, and 8.

Audio Books	Utilize pre-reading strategies and activities previews, anticipatory guides, and semantic mapping	Modified assessment grading	
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- Larson, Ron and Laurie Boswell. Big Ideas Math: Algebra 1. A Common Core Curriculum. Big Ideas Learning, 2015