Summit Public Schools

Summit, New Jersey

Grade Level 11-12/ Content Area: Mathematics

Length of Course: Full Academic Year

Curriculum: Integrated Algebra

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Building on the understanding of linear, quadratic and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations.

Unit 1: Equations and Problem Solving (Q1)

	Sections in Text	**Practice Problems**
1	2.1 Linear equations (one variable) Focus: fractions	Page 55 #1-7 odd, 17, 19, 21, 23, 25, 31, 35, 36
2	2.3 (1) Formulas and problem solving	Page 73 #1-19 odd (omit 11) and 20
3	2.3 (2) Formula applications	Page 73-74 #25, 27, 31, 35, 39, 41, 43
4	Quiz 2.1 & 2.3	
5	2.6 Absolute value equations	Page 101 #1, 5, 7, 35, 39, 43, 49, 53, 59

6	Review	Page 111# 1-17odd and Page 112 #33-35, 39, 40 and Page 113 #66-76 even
7	Test Unit 1	

<table>
<tr><td colspan="2" align="center">Standard A-SSE, A-CED, A-REI
Seeing Structure in Expressions
Create equations that describe numbers or relationships.
Understand solving equations as a process of reasoning and explain the reasoning.</td></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
● Solving linear equations in one variable
● Rearranging formulas to solve problems
● Solve absolute value equations and its applications</td></tr>
<tr><td align="center">Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</td><td align="center">Enduring Understandings
What will students understand about the big ideas?</td></tr>
<tr><td>● How do you solve linear equations with one variable?
● How can you use a formula for one measurement to write a formula for a different measurement?
● What is absolute value?</td><td>Students will understand that…
● Using inverse operations, you can solve for the variable.
● By solving an equation for one variable, it allows you to find another measurement easily
● Absolute value represents the distance from 0. Therefore when you solve absolute value equations, you often have two solutions.</td></tr>
<tr><td align="center">Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</td><td align="center">Examples, Outcomes, Assessments</td></tr>
<tr><td>Students will:
A.SSE.1 Interpret expressions that represent a quantity in terms of its context.

A-CED.1 - Create equations and inequalities in one variable and use them to solve problems.

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

A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</td><td>Instructional Focus (2 weeks):

In linear equations, sections 2.1, the focus will be to enhance the student's ability to work with fractional coefficients.
$\frac{\square}{2}+\frac{\square}{3}=\frac{3}{4}$

During section 2.3, the objective for the lesson to solve formulas for different variables and demonstrate applications for solving formulas. In this section, begin focusing on solving literal equations that only use multiplication and division operations. Then, add in addition and and subtraction type problems. Day 2 should focus on applications.

The final section in this unit is absolute value equations. Student should be well versed in the idea that absolute value represents</td></tr>
</table>

A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	distance and that distance can never be negative. Students will also understand how to set up absolute value equations into two entities. Example Problem for this set: $\|3x+2\|=\|5x-8\|$ **Interdisciplinary Connection:** Solving formulas is an important topic in science. A warm-up for students can be found on page 75 #46. Students can see the connection between satellites and formulas used to model their pathway. **Technology:** An extension activity for students could be to uses google sheets to create a budget activity. They can use formulas to add the total amount spent and analyse that according to what they make. http://www.makeuseof.com/tag/15-excel-formulas-will-help-solve-real-life-problems/ **Global Perspective:** On page 76, the text provides a concept extension involving average distance between the earth and son. The conversion between miles and AU is given. Have a discussion with students about the reason why we have different units of measurement. Why does the AU exist?

Unit 2: Inequalities (Q1)

	Sections in Text	Practice Problems
8	2.4 Linear Inequalities with set notation and interval notation	Page 85 #1-7 odd, 23, 25, 27, 29, 49, 51, 53, 57
9	2.4 Linear inequalities with fractional coefficients	Page 86 #59-67 odd
10	Quiz 2.4	
11	2.5 Compound inequalities	Page 94-95 #19-31 odd, 39, 41, 43, 85, 87
12	2.7 Absolute value inequalities	Page 105 #1-13 odd and Page 106 #59, 61, 95, 97
13	Review	Page 112 #47, 49, 53, 56, 57, 59, 61, 63 Page 113 #77, 79, 81, 95, 96
14	Test	

<table>
<tr><td colspan="2">Standard A-CED & A-REI
Create equations that describe numbers or relationships.
Understand solving equations as a process of reasoning and explain the reasoning.</td></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
● Solve inequalities of one variable and write solutions in set notation and interval notation.
● Solve compound inequalities and determine when there are infinite and non solution sets.
● Solve absolute value inequalities.</td></tr>
<tr><td>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</td><td>Enduring Understandings
What will students understand about the big ideas?</td></tr>
<tr><td>● What are set notation and interval notation?
● What is the difference between and “and” inequality and an “or” inequality?</td><td>Students will understand that…
● These types of notations are ways of showing solutions over a set of numbers.
● An “and” inequality determines the intersection between two inequalities whereas an or inequality shows the union of two inequalities.</td></tr>
<tr><td>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</td><td>Examples, Outcomes, Assessments</td></tr>
<tr><td>Students will:</td><td>Instructional Focus: (2 Weeks)</td></tr>
</table>

A-CED.1 - Create equations and 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 non-viable options in a modeling context. A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	In linear equalities, sections 2.4, the focus will be to enhance the student's ability to work with set and interval notation. Students should be able to graph and write the answer in interval notation. Day 2 of linear inequalities will focus on fractional coefficients. Example problem for this set: $\frac{2}{5}$(x -6)≥ □ $- 1$ During section 2.5, the objective for the lesson is solve compound inequalities by finding the intersection of two sets and solving them using and/or. An emphasis will be given to writing the answer in interval notation. The final section in this unit is absolute value inequalities. Student should be well versed in the idea that absolute value represents distance from zero from Unit 1.Students will continue to set up absolute value equations into two entities, like in Unit 1. Example Problem for this set: |3y+2|≥6 **Interdisciplinary Connection:** Students can look at the example problem #8 on page 83 that involves calculating income in a commission type job. This is an important topic that is covered in personal finance. **Technology:** An extension activity for students could be to have students work in groups to reteach compound or absolute value inequalities and prepare PPT presentation or video for review.

Unit 3: Functions (Q1)

	Sections in Text	Practice Problems
15	3.1 Graphs of functions (Table of Values)	Page 126 #11-16, 31, 33, 37, 39, 41
16	3.2 (1) Functional notation	Page 141-142 #53-61 odd, 75, 76, 79, 81, 83, 87
17	Quiz 3.1 & 3.2 (1)	
18	3.2 (2) Domain and range of relations	Page 139-1401#1, 3, 11, 15, 17, 41-51 odd
19	3.2 (3)Domain and range from a graph	Page 140-141 #23-39 odd
20	Review	Page 194 #7, 9, 11 Page 195 #19, 21, 25, 26, 27-38
21	Test	

<table>
<tr><th colspan="2">Standard F-I
Interpreting Functions</th></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
Graphs of Functions
Functional Notation
Domain and Range</td></tr>
<tr><td>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</td><td>Enduring Understandings
What will students understand about the big ideas?</td></tr>
<tr><td>What is domain and range? Are there ever any values that cannot be in the domain of a function?</td><td>Students will understand that…
Domain refers to x values whereas the range refers to the y values. Yes, rational functions and square root functions are the most notable functions that have restricted domains.</td></tr>
<tr><td>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</td><td>Examples, Outcomes, Assessments</td></tr>
<tr><td>Students will:
F-IF 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the</td><td>Instructional Focus: (2 Weeks)

In functions, sections 3.1, the focus will be to have the student's ability to make a graph from a table of values.</td></tr>
</table>

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). 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.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.	During section 3.2(1), the objective of the lesson will be to have the students understand functional notation along with when and how it is used. Day 2 will cover domain and range relations. Then, in section 3.2(3), the focus changes into determining if graphs are functions by using the vertical line test. Example problem from this set: If f(x)=3x+3, find f(4). **Technology:** Students can use functions to describe where one quantity determines another. For example, $10,000 invested at an annual percentage rate of 4.25% is a function of the length of time the money is invested. Have students create a graph using a spreadsheet using different lengths of time the money is invested. It may help to to have a visual representation from the data to see the more dramatic effect. **Global Perspective:** On page 142, the text provides two problems (87-88) that involves a function where students can predict the world's diamond production. Have a discussion about trends and how to use the function notation to predict diamond production in the future.

Unit 4: Linear Functions (Q1)

	Sections in Text	Practice Problems
22	3.3 (1) Linear relationships	Page 149 #1-12 all. (Pair together the following problems on the same graphs: 1&3, 2&4, 5&7, 6&8).
23	3.3 (2) Intercepts	Page 151# 13, 17, 19, 20, 73, 74
24	3.4 (1) Slope and rate of change	Page 162 #1-13 odd and Page 164 #89, 103, 105, 107
25	3.4 (2) Slope-intercept form	Page 162 #47-59 odd
26	Review 3.3-3.4	Page 195 #39-42 Page 196 #47-69 odd
27	Quiz 3.3-3.4	
28	3.5 (1) Writing equations for lines	Page 172-174 #13, 15, 17, 21, 21, 23, 33, 41, 43, 75, 77
29	3.5 (2) Parallel and perpendicular lines	Page 173 #47, 49, 51 and Page 162 #61-68
30	Review	Page 196 #44-70 even, 71, 72, 73, 85-93 odd, 96, 97
31	Test	

Standard S-ID, F-LE, A-REI, F-IF

Summarize, represent, and interpret data on two categorical and quantitative variables.Interpret linear models. Construct and compare linear, quadratic, and exponential models and solve problems. Interpret expressions for functions in terms of the situation they model.Construct and compare linear, quadratic, and exponential models and solve problems.Interpret expressions for functions in terms of the situation they model. Understand the concept of a function and use function notation. Interpret functions that arise in applications in terms of the context.

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

- Types of Linear Relationships
- Slope, Rate of Change and Intercepts
- Slope-intercept form
- Write equations for lines given different constraints

Essential Questions *What provocative questions will foster inquiry,*	Enduring Understandings *What will students understand about the big ideas?*

understanding, and transfer of learning?	
• What types of situations are modeled by linear relationships? • How do you calculate slope and rate of change from a graph or model? • What is the slope intercepts form of an equation?	Students will understand that… • Situations that grow or decline at a constant rate are linear relationships. • The slope compares the vertical height to the horizontal height. Rate of change is often used to look at the slope over a given time period. • The slope intercept form of an equation has y solved for and is set = to the slope per x plus or minus the y-intercept. ie y = mx+b
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
Students will: S-ID.7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. F-LE.1 – Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. A-REI.12 - Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. F-IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	Instructional Focus: (3 weeks) In linear relationships, section 3.3 (1), the focus will be to compare linear functions with different y-intercepts. In section 3.3(2), students will graph linear functions by finding x and y intercepts. During section 3.4 (1), the objective for the lesson is to find the slope of a line given two points and the equation of a line. Then, students will be able to interpret the slope intercept form in an application problem. Example problem from this set: Find the slope of the line containing points (5,-4) and (-3,3). Graph the line. The final sections in this unit 3.5 (1) and (2) relate to writing equations for lines. Student should be well versed in slope-intercept form and point- slope form and be able to find equations of parallel and perpendicular lines. **Interdisciplinary Connection:** Writing equations is an important topic in science. Students can make model cars and test their speed by testing for velocity when using different slopes. Students can then make predictions and write equations based upon the slopes. **Technology:** An extension activity for students could be to have students collect data on the amount of water used in their homes over three month period. Students can make a line graph and write an equation that shows the amount of water that is used in the home. Students can then make predictions on monthly family consumption.

Unit 5: Extension of Functions (Q2)

	Sections in Text	**Practice Problems**
1	3.6 (1) Piecewise functions	Page 182-183 #1, 3, 5, 7, 13, 55
2	In class practice: piecewise functions	Page 182-183 #2, 4, 6, 8, 12, 14, 56
3	3.6 (2) Parent graphs	Page 183 #17-47 odd
4	In class practice: parent graphs	Page 183 #18-48 even
5	Quiz 3.6	
6	9.1 Operations with functions	Page 540-541 #1, 2, 3, 16, 17, 19, 54
7	9.2 Inverses of functions	Page 550-551 #23, 25, 27, 33, 41, 42, 47
8	Review	Page 197 #99, 100, 123, 124, 125, 126 and Page 198 #28-30 and Page 596 #1-6, 23, 27, 29
9	Review	
10	Test	

<table>
<tr><td colspan="2">Standard F-I &, F-BF
Interpreting Function & Building Functions</td></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
● Piecewise functions
● Parent graphs (linear, quadratic, square root,and absolute value functions)
● Operations with functions
● Inverses of functions</td></tr>
<tr><td>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</td><td>Enduring Understandings
What will students understand about the big ideas?</td></tr>
<tr><td>● What is a piecewise function?
● What is vertex form and how can it be applied to functions?
● How do you find the inverse of a function?</td><td>Students will understand that…
● A piecewise function is two or more functions examined on the same graph but are contained by a certain interval.
● Using parent graphs and rules of vertex form, any function can be manipulated to be easily graphed.</td></tr>
</table>

	● To find the inverse of a function, simply switch the input and output.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
Students will: F-IF 7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F-IF 7 a) Graph linear and quadratic functions and show intercepts, maxima, and minima. F-IF 7 b) Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. F-BF 1b) Combine standard function types using arithmetic operations. F-BF 1c) (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. F-BF 13. 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them. F-BF 14. Find inverse functions. a) 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.	Instructional Focus: (3 Weeks) In section 3.6 (1), the focus will be to enhance the student's understanding of piecewise-defined functions. Students will be introduced to parent functions in the next section 3.6 (2). Day 2 after both of these sections will follow with an in class practice activity to increase the student's understanding. During section 9.1, the objective for the lesson is to introduce students to adding, subtracting, multiplying and dividing functions. Example problem from this set: If f(x) = x+2 and g(x)=3x+5, find (f-g)(x). The final section in this unit covers inverses of functions. Students should be able to follow the steps for finding the inverse of one-to-one functions. **Interdisciplinary Connection:** Functions with operations is an important topic in science. The example problem 2 on page 537 discusses the combination of functions using different temperature scales. Students can see the relationship between the input and outputs in function composition. **Technology:** An extension activity for students could be to use the federal tax information from this website to create a piecewise function. http://www.moneychimp.com/features/tax_brackets.htm

Unit 6: Systems of Equations (Q2)

	Sections in Text	Practice Problems
11	4.1 (1) Solving systems of equations by graphing	Page 212 #9, 12, 13, 14, 79, 80, 81
12	4.1 (2) Elimination and substitution	Page 212 #15-17, 23, 25, 29, 31
13	4.2 Systems of equation with three variables	Page 220 #1, 15, 19, 23
14	In class practice: Systems with three variables	
15	Review	Page 234 #1-4, 5-15, 19
16	Quiz 4.1 & 4.2	
17	4.3 (1) Problem solving and systems	Page 231 #11-14, 18, 19
18	4.3 (2) Break even problems	Page 233 #29, 31, 33, 35 & 36
19	Quiz 4.3	
20	4.4 Solving systems using technology	Page 239 #1, 3, 9, 11
21	4.5 Systems of linear inequalities	Page 243 #1-19 odd
22	Review	Page 251 #47 (solve by graphing) #49 (solve by substitution) #3 (solve by elimination) 5, 8, 10, 11, 13, 15, 54
23	Review	
24	Test	

Standard A-REI & A-CED *Reasoning with Equations & Inequalities & Creating Equations*	
Big Ideas: *Course Objectives / Content Statement(s)* ● Solve Systems using elimination, and substitution ● Solve systems of three variables ● Use technology to solve systems	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	Enduring Understandings *What will students understand about the big ideas?*

- How many solutions can exist given a system of equations? - How can solutions to linear help with cost effectiveness?	Students will understand that… - A system of equations can have one solution (ie. there is exactly one point that each line shares). - A system of equations can have an infinite number of solutions (ie. the linear functions share all points because the lines share a common slope and *y*-intercept). - A system of equations can have no solution (ie. the lines share no common points because the lines share a common slope but a different *y*-intercept).
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
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. A-REI 9. Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 ! 3 or greater).	Instructional Focus: (3 Weeks) In systems of equations, sections 4.1, the focus will be to solve systems of equations by graphing, elimination and substitution. In section 4.2, students will be introduced to systems of equations with three variables. Day 2 will present an opportunity for more in class practice to deepen understanding. During section 4.3, the objective for the lessons is to have students solve word problems and break even problems that relate to real life. Example problem set can be found on page 227 (Example 5). The final section in this unit (4.5) has student's solve systems using technology. **Interdisciplinary Connection:** Solving systems of linear equations is an important topic in science. A warm-up for students can be found on page 225 (Example 4). Students can see the connection between mixing liquids of different viscosities to create a new solution. **Technology:** An extension activity for students could be to have them create their own break even problem using rental car rates (daily and each additional mile). Students can create as many different scenarios but will need to graph the equations to see which option is the best deal. Discuss with students about length of trips and the effect on their decision.

Unit 7A: Exponents (Q2)

	Sections in Text	Practice Problems
25	5.1 Monomials: multiplication, division, negative exponents, zero exponents	Page 262 #1-37 odd, 51
26	5.2 Power rules	Page 268 #1-25 odd
27	5.1-5.2 Ext: Scientific notation	Page 262-263 #99-107 odd,117 and 119 and Page 268-269 #69-75, 98
28	Review	Page 329 #1-14, 17-34
29	Test	

Unit 7B: Polynomials, and Polynomial Functions (Q3)

	Sections in Text	Practice Problems
1	5.3 Polynomials: classification, degree, simplifying	Page 279 #11-19 odd, 55-67 odd
2	5.4 Multiplying polynomials	Page 289 #5-13 odd, 21, 23, 27, 29, 31, 33
3	Quiz 5.3-5.4	
4	5.5 Factoring using GCF and grouping	Page 295 #13-33 odd
5	5.6 (1) Factoring trinomials (a=1)	Page 303 #1-14
6	5.6 (2) Factoring trinomials (a>1)	Page 303 #15-33 odd (omit #29)
7	Review 5.5-5.6	Page 330-331 #79-87 odd, 91-99
8	Quiz 5.5-5.6	
9	5.7 (1) Special products	Page 309 #1-5, 13-15, 19, 20, 41-46
10	5.7 (2) Sum and difference of cubes	Page 309 #27-33
11	Review	Page 332 #1-24
12	Review	
13	Test	

<table>
<tr><td colspan="2">Standard A-APR & Standard A-SSE
Arithmetic with Polynomials and Rational Expressions & Seeing Structure in Expressions</td></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
Monomial Expressions
Polynomials
Factoring</td></tr>
<tr><td>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</td><td>Enduring Understandings
What will students understand about the big ideas?</td></tr>
<tr><td>Where are the power rules for monomials derived from?
How can we apply the distributive property to polynomial multiplication?
What is factoring and what is the relationship between a polynomial and its factors?</td><td>Students will understand that…
That the rules for powers are derived from basic concepts
adding powers:
subtracting powers:
negative exponents:
zero power:
multiplying powers:
A polynomial times another polynomial, “Foiling”, is simply the act of distributing the terms in the first polynomial to the terms in the other polynomial.
Factoring is the process of breaking down a polynomial into the multiplication of two or more polynomials or monomials. Just like a number can be broken down into it’s primes, a polynomial can be broken down it’s composite terms.</td></tr>
<tr><td>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</td><td>Examples, Outcomes, Assessments</td></tr>
<tr><td>Students will:
A-SSE 1. a) Interpret parts of an expression, such as terms, factors, and coefficients.

A-SSE 2.Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2).

A-SSE 3.Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</td><td>Instructional Focus: (4 weeks)

In section 5.1, the focus will be on monomials. Students will be introduced to multiplication, division,negative and zero exponents. Section 5.2 will begin to use the power rules for exponents. Example problem set: Day 3 will provide an extension activity with scientific notation.

In section 5.3, the lessons change to polynomials. Students will become more familiar with classifying, simplifying and naming the degree of polynomials. Section 5.4 will introduce students to multiplication of polynomials.</td></tr>
</table>

A-APR 4. Prove polynomial identities and use them to describe numerical relationships.	In section 5.5, students begin working with factoring. GCF and grouping are the two methods students will be exposed to in this section Then, students will begin to go further in depth in factoring over the next two sections involving factoring trinomials when a>1 and when a<1. Special factoring cases will close out the unit by focusing on the sum and difference of cubes. **Interdisciplinary Connection:** Scientific notation is an important topic in science. A problem involving density of ordinary water can be found on page 269 #98. Students can see the connection between volume and mass. **Technology:** An extension activity for students could be to have students solve cubic equations with using a graphing calculator. Students can research aquariums across the U.S. to calculate the amount of water (volume) and find each dimension by factoring using the aquariums volume.

Unit 8A: Radicals and Rational Exponents (Q3)

	Sections in Text	**Practice Problems**
14	7.1 Radicals	Page 416-417 #1-11 odd, 19-41 odd
15	7.2 Rational exponents	Page 424 #1-8, 17-22, 29-32
16	In class review: rational exponents	
17	7.3 (1) Simplifying radicals	Page 433 #31-59 odd
18	7.3 (2) Multiplying radicals and simplifying radical with fractional radicands	Page 432-433 #1-29 odd
19	Review 7.3	Page 433 #2-10even, 16, 20, 24, 28, 32-58 even
20	Quiz 7.3	
21	7.4 (1) Adding and subtracting radicals	Page 438 #1-10, 18-24
22	7.4 (2) Multiplying radical expressions	Page 439 #47-65 odd, 73
23	Review 7.1-7.4	Page 468-469 #1-13 odd, 27-39 odd, 59-71 odd, 87-89, 95-97, 103, 105
24	Quiz 7.1-7.4	
25	7.5 Rationalizing denominators	Page 445 #1-21
26	7.6 Solving radical equations	Page 453 #1-13 odd, 23-37 odd, 41, 45, 54, 56
27	Review	Page 468-469 #2-14 even, 28-36 even, 60,66, 68, 93, 104, 117-120
28	Review	
29	Test	

Unit 8B: Complex Numbers (Q4)

	Sections in Text	Practice Problems
1	7.7 (1) Introduction to complex numbers (simplifying radicals with negative radicands)	Page 463 #1-22

2	7.7 (2) Operations with complex numbers	Page 463 #27-40, 83, 86, 89
3	7.7 (3) Rationalizing complex denominators	Page 463 #41-48
4	Review	Page 470 #127-140 and Page 471 #30
5	Review	
6	Quest Complex Numbers	

Standard N-RN, N-CN, A-REI *The Real & Complex Number System & Reasoning with Equations*	
Big Ideas: *Course Objectives / Content Statement(s)* ● Radical Expressions ● Fractional Roots ● Solving Radical Equations ● Complex Numbers	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	Enduring Understandings *What will students understand about the big ideas?*
● What is the difference between a radical and a square root? ● Why is it necessary for roots to “match” in order to add or subtract radicals? ● What is *i* ?	Students will understand that… ● The radical is the symbol, square root is the operation of that produces the number that is being multiplied by itself. ● Just like variables must be alike to combine like terms, so must radicals as they too are two numerical values being multiplied together. ● *i* represents the square root of negative 1. Imaginary numbers are part of the complex number system.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
Students will: A-REI 2.Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. N-RN 1.Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 51/3 to	Instructional Focus (4 weeks): In section 7.1, the focus will be on radical notation. Students will be introduced to cube roots and nth roots before moving on to rational exponents in section 7.2. Students will look to understand the meaning of a □/□ Example problem set: □□□□□□□□ $16^{-3/4}$ During section 7.3, students will simplify radicals and

be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5. N-RN 2.Rewrite expressions involving radicals and rational exponents using the properties of exponents. Use properties of rational and irrational numbers. N-RN 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. N-CN 1.Know there is a complex number i such that i2 = –1, and every complex number has the form a + bi with a and b real. N-CN 2.Use the relation i2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	move on to multiplying radicals and simplifying radicals with fractional radicands.In section 7.4, the objective of the lesson is to introduce addition and subtraction of radicals. Day 2 will move on to multiplying radical expressions. Example problem set: $\sqrt{3}(5 + \sqrt{30})$ In section 7.5 and 7.6, students will learn how to rationalize denominators and solve equations that contain radical expressions. Example problem set: Solve $\sqrt{2\square - 3} = 9$ The final section in this unit will introduce students to complex numbers. Areas of concentration will be simplifying radicals with negative radicands, operations with complex numbers and rationalizing complex denominators. Example problem: Divide. Write in the form a+bi. $\frac{2+\square}{1-\square}$ **Interdisciplinary Connection:** Students can use rational exponents to solve problems in Biology. Take a look at the practice problems in the link below that deal with an approximate value that contains rational exponents. http://www.carlisleschools.org/webpages/wolfer/files/AlgII%206-2%20Rules%20of%20Exponents%20JIGSAW.pdf **Global Perspective:**An extension activity for students using complex numbers and having them applied to art. In this lesson, students examine and draw representations of cubes and then learn how to analyze these representations using complex numbers. Students use what they know about operations on complex numbers to see if a drawing is an accurate representation of a cube. They also learn how to generate complex numbers that will produce such representations. https://illuminations.nctm.org/Lesson.aspx?id=4228

Unit 9: Quadratic Equations (Q4)

	Sections in Text	Practice Problems
7	8.0 Solving quadratic equations by factoring	Page 323 #29-40, 61, 62
8	8.1 (1) Solving quadratic equations by taking square roots	Page 482 #1-25 odd
9	8.1 (2) Solving quadratic equations by completing the square	Page 483 #37, 38, 41, 42, 51, 52, 61
10	Review 8.0-8.1	
11	Quiz 8.0-8.1	
12	8.2 Solving quadratic equations by the quadratic formula	Page 492 #7, 9, 11,19, 27, 31 (27 and 31 yield imaginary solutions)
13	8.0-8.2 Best method	Page 504 #1, 3, 5, 11, 14-17
14	Review 8.0-8.2	
15	Quiz 8.0-8.2	
16	8.5 Graphing quadratic functions vertex form	Page 519 #1, 7, 13, 19-29 odd
17	8.6 (1) Graphing quadratic functions in standard form	Page 526 #23, 25, 27, 37, 39, 41
18	8.6 (2) Applications of quadratic functions	Page 493 #63, 64 and Page 527 #56, 57, 87
19	Review	Page 531-532 #1-4,8, 16, 17, 41, 43, 45, 47, 49, 50, 53, 54
20	Review	
21	Test	

<table>
<tr><td colspan="2" align="center">Standard F-IF & A-REI & A-SSE
Interpreting Functions & Reasoning with Equations and Inequalities
& Seeing Structure in Expressions</td></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
Students with be able to find the solutions to a quadratic function by graphing, factoring, completing the square and using the quadratic equation</td></tr>
<tr><td align="center">Essential Questions</td><td align="center">Enduring Understandings</td></tr>
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What provocative questions will foster inquiry, understanding, and transfer of learning?	*What will students understand about the big ideas?*
● What does it mean to be a root to a quadratic equation? ● What are ways we can find roots? ● How many roots does a quadratic equation have?	Students will understand that… ● Roots are solutions to a quadratic equation. They are also known as zeros. ● A root can be found where the quadratic function crosses the *x*-axis. ● A quadratic function can have 0, 1 or 2 real roots. If a function has zero real roots, then the roots to the function are, in fact, imaginary.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments
Students will: F-IF 8. a) Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. 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 4.Solve quadratic equations in one variable. A-REI 4.a) 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. A-REI 4.b) Solve quadratic equations by inspection (e.g., for x2 = 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 % bi for real numbers a and b.	Instructional Focus: (4 weeks) In quadratic equations, sections 8.0 and 8.1, the focus will be to enhance the student's ability to solve quadratic equations by factoring, taking square roots and completing the square. During section 8.2, the lesson moves on to solving quadratic equations using the quadratic formula. After all methods are introduced in the first two sections, students will learn how to apply the best method to solve the quadratic equation. The final section in this unit focuses on graphing quadratic functions in vertex form and standard form. Applications of quadratic will be discussed before taking the unit test. **Interdisciplinary Connection:** Solving quadratic equations can be related to Health/Wellness or Physical education. On page 495, problem # 90 discusses the relationship between body weight and Recommended dietary allowance for Vitamin A in children up to 10. The relationship is modeled by a quadratic equation. **Technology:** An extension activity for students could be found on this website where a professional basketball player poses a question about a free throw shot. Students can work in teams to answer the question and take the challenge. http://www.thirteen.org/get-the-math/teachers/math-in-basketball-lesson-plan/activities/206/

Unit 10: Exponential Growth and Decay (Q4)

	Sections in Text	Practice Problems
22	9.3 (1) Applications of exponential growth	Page 559 #39, 41, 43
23	9.3 (2) Applications of exponential decay	Page 559 #37 & 38 and Page 564 #16 (make a table)
24	9.3 (3) Using a table of values to graph exponential functions	Page 558 #1-15odd
25	Review 9.3	
26	9.4 Growth and Decay Formulas	Page 564#13-15 and Page 560 #47-50
27	Review	Page 596 #37-42
28	Test	

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<tr><th colspan="2">Standard F-LE & F-IF
Linear, Quadratic, and Exponential Models & Interpreting Functions</th></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)
● Graphs of Exponential Functions
● Examine real life exponential growth and decay models</td></tr>
<tr><th>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</th><th>Enduring Understandings
What will students understand about the big ideas?</th></tr>
<tr><td>● What is an exponential function?
● How do exponential functions relate to money?</td><td>Students will understand that…
● A function that models repeated multiplication (ie, have a input variable as the exponent) is an exponential function.
● Money is a great example of exponential growth. Interest is often compounded. This is how people earn money on investments.</td></tr>
<tr><th>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</th><th>Examples, Outcomes, Assessments</th></tr>
<tr><td>Students will:
F-IF 7 e) Graph exponential and logarithmic functions, showing intercepts and end behavior, and</td><td>Instructional Focus (1.5 weeks):

Section 9.3 introduces students to exponential growth and</td></tr>
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trigonometric functions, showing period, midline, and amplitude. F-LE 5.Interpret the parameters in a linear or exponential function in terms of a context.	decay. Day 2 will focus on applications of the growth/decay formula, as well as have students graph exponential functions using a table. **Interdisciplinary Connection:** Solving formulas is an important topic in personal finance/business. A compound interest problem can be found on page 556 (example 5). Students can compare and contrast the different number of times interest is compounded yearly using the compound interest formula. **Technology:** An extension activity for students would be to have students evaluate the growth of Starbucks stores since 1971. Using this link: http://globalassets.starbucks.com/assets/5deaa36b7f454011a8597d271f552106.pdf, students can use Desmos or Excel to record the data. And make inferences about the growth rate of Starbucks. Is the franchise growing too fast? **Global Perspective:** On page 559, in problem #42, students are given an exponential function to represent the amount of carbon dioxide that contributes to global warming. Students can use the formula to predict the concentration of Carbon dioxide in the atmosphere in the future. Students can make the connections between the growth/decay formula and predictions given an exponential function. Have students create their own problem predicting the number of cell phone users in the year 2030 and beyond.