Unit One Information

Curriculum Map: Quadratics Revisited

Content Descriptors:

Concept 1: Perform arithmetic operations with complex numbers.

Concept 2: Use complex numbers in polynomial identities and equations.

Concept 3: Solve equations and inequalities in one variable.

Concept 4:. Extend the properties of exponents to rational exponents.

Content from Frameworks: Quadratics Revisited

Unit Length: Approximately 15 days

TCSS – GSE Algebra 2/Advanced Algebra Unit 1
Curriculum Map

***Unit Rational*:**

Students will revisit solving quadratic equations in this unit. Students explore relationships between number systems: whole numbers, integers, rational numbers, real numbers, and complex numbers. Students will perform operations with complex numbers and solve quadratic equations with complex solutions. Students will also extend the laws of exponents to rational exponents and use those properties to evaluate and simplify expressions containing rational exponents.

Prerequisites: As identified by the GSE Frameworks	***Length of Unit***
✓ *number sense* ✓ *computation with whole numbers and integers, including application of order of operations* ✓ *operations with algebraic expressions* ✓ *simplification of radicals* ✓ *measuring length and finding perimeter and area of rectangles and squares* ✓ *laws of exponents, especially the power rule*	*15 Days*

Concept 1	***Concept 2***	***Concept 3***	***Concept 4***
Perform arithmetic operations with complex numbers.	Use complex numbers in polynomial equations.	Solve equations and inequalities in one variable	Extend the properties of exponents to rational exponents.
GSE Standards	***GSE Standards***	***GSE Standards***	***GSE Standards***
MGSE9-12.N.CN.1 Understand there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi where a and b are real numbers. **MGSE9-12.N.CN.2** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **MGSE9-12.N.CN.3 Find the conjugate of a complex number; use the conjugate to find the ~~absolute value (modulus) and~~ quotient of complex numbers.**	**MGSE9-12.N.CN.7 Solve quadratic equations with real coefficients that have complex solutions by (but not limited to) square roots, completing the square, and the quadratic formula.** **MGSE9-12.N.CN.8 Extend polynomial identities to include factoring with complex numbers.**	**MGSE9-12.A.REI.4** Solve quadratic equations in one variable. **MGSE9-12.A.REI.4b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions).**	**MGSE9-12.N.RN.1 Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{(1/3)}$ to be the cube root of 5 because we want $[5^{(1/3)}]^3 = 5^{[(1/3) \times 3]}$ to hold, so $[5^{(1/3)}]^3$ must equal 5.*** **MGSE9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

TCSS – GSE Algebra 2/Advanced Algebra Unit 1

Lesson Essential Question

- What is a complex number and how do you simplify them?
- How do you add, subtract, and multiply complex numbers?
- What is a conjugate and how do you use it to divide complex numbers?

Vocabulary

Complex number
complex conjugate
complex plane real
number imaginary
unit Imaginary
number

Sample Assessment Items

MGSE9-12.N.CN.1
Complex numbers are written in the form a + bi.

Which of these is/are real numbers?
A) a only
B) b only
C) a and b only
D) i only

MGSE9-12.N.CN.2
Perform the indicated operation.
(-9 + 2i) - (-12 + 4i) =

a. -21 - 6i
b. -3 + 6i
c. 3 - 2i
d. 21 + 2i

MGSE9-12.N.CN.3

Solve for : $\frac{4+2i}{3-i}$

a. i b. $1+i$ c. $\frac{2}{1-i}$ d. $\frac{7+i}{4-3i}$

Lesson Essential Question

- How do you solve a quadratic equation that has complex solutions?
- How do I factor polynomials that have complex solutions?

Vocabulary

Solution
x-intercept
roots
zeros
Square Root Method
Quadratic Formula
Complex solutions
Binomial expression

Sample Assessment Items

MGSE9-12.N.CN.7
Solve for x:
a. using square root method
b. by completing the square
c. using the quadratic formula
$x^2 + 8 = 0$

$x = \pm 2i\sqrt{2}$

MGSE9-12.N.CN.8
Rewrite $x^2 + 4$ by factoring with complex numbers.

$(x + 2i)(x - 2i)$

Lesson Essential Question

- How do I solve quadratic equations?
- How do I solve quadratic equations by inspection?

Vocabulary

Polynomial
Standard for of a polynomial
Trinomial

Sample Assessment Items

MGSE9-12.A.REI.4
Solve for x: $x^2 + 3x - 12 = 6$
x = -6 and x = 3

MGSE9-12.A.REI.4b
Solve for x: $7x^2 + 1 = 29$

$\{2, -2\}$

Lesson Essential Question

- How do you extend the properties of exponents to rational exponents?

Vocabulary

rational exponents
expression
rational expression
rational number
Irrational number
Whole number

Sample Assessment Items

MGSE9-12.N.RN.1
Which example explains the definition of rational exponents by extending the properties of integer exponents to radical expressions?

a. $\sqrt[4]{y^4} = (y^4)^{1/4} = y^{4 \cdot \frac{1}{4}} = y$

b. $\sqrt[4]{t^5 \cdot t^4} = \sqrt[4]{t^9} = t^2\sqrt[4]{t}$

c. $\sqrt[3]{24x^5} = \sqrt[3]{8 \cdot 3x^5} = 2x\sqrt[3]{3x^2}$

d. $\sqrt{128m^5n^6} = \sqrt{64 \cdot 2m^5n^6} = 8m^2n^3\sqrt{2m}$

MGSE9-12.N.RN.2

Which expression is equivalent to $\sqrt[3]{27x^{12}} + \sqrt[4]{16x^3} - \sqrt[2]{25x}$?

a. $3x^4 + 2x - 5$

b. $3x^4 + 2x^{3/4} - 5x^{1/2}$

c. $3x^{36} + 2x^{12} - 5x^2$

d. $3x^{1/4} + 2x^{4/3} - 5x^2$

TCSS – GSE Algebra 2/Advanced Algebra Unit 1

Resources – Concept 1	Resources – Concept 2	Resources – Concept 3	Resources – Concept 4
❖ Instructional Strategies & Common Misconceptions N.CN.1-3 ❖ Intro to Complex Numbers (power point) ❖ What are Complex Numbers? (power point) ❖ Add/Subtract Complex Numbers (power point) ❖ Multiplying/Dividing Complex Numbers (power point) ❖ Bingo review game ❖ "I have, who has?"	❖ Instructional Strategies & Common Misconceptions N.CN.7 ❖ Graphic organizer – Quadratic Formula 1 ❖ Solving by factoring worksheet ❖ Guided Quadratic Formula practice ❖ Activator/Summarizer ❖ Graphic Organizer – Zeros of a polynomial function	❖ Instructional Strategies & Common Misconceptions (A.REI.4) ❖ Solving Quadratics (Power Point) ❖ Factoring Practice ❖ Find Someone Who…Factoring	❖ Instructional Strategies & Common Misconceptions N.RN.1-2 ❖ Fractional Exponents (power point) ❖ Who wants to be a Millionaire Review
Concept 1 Differentiated Activities	**Concept 2 Differentiated Activities**	**Concept 3 Differentiated Activities**	**Concept 4 Differentiated Activities**
❖ Differentiated Activity – complex number match	❖ Solving using QR codes	❖ Matching Factoring Activity ❖ Polynomial Tiered Assignment ❖ Math Trick (alternative explanation) ❖ Solving Sudoku ❖ Solving Riddle (quadratic formula) ❖ Solving Riddle (completing the square)	

At the end of Unit 1 student's should be able to say "I can…"

- ✓ Make connections between radicals and fractional exponents.
- ✓ Distinguish between real and imaginary numbers. Results of operations performed between numbers from a particular number set does not always belong to the same set.
- ✓ Realize that irrational numbers are not the same as complex numbers.
- ✓ Results of operations performed between numbers from a particular number set does not always belong to the same set. For example, the sum of two irrational numbers $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$ is 4, which is a rational number; however, the sum of a rational number 2 and irrational number $\sqrt{3}$ is an irrational number $(2 + \sqrt{3})$