Unit Title	Poly Want a Nomial?		**Length of Unit**	4 Weeks
Focusing Lens(es)	Transformations Structure	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.1 MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.3 MA10-GR.HS-S.2-GLE.4 MA10-GR.HS-S.4-GLE.3	
Inquiry Questions (Engaging-Debatable):	• What is the square root of negative 1? What are the implications of having a solution to this problem? • How did the ancient Greeks multiply binomials and find roots of quadratic equations without algebraic notations? (MA10-GR.HS-S.2-GLE.3-IQ.2)			
Unit Strands	Number and Quantity: The Complex Number System Functions: Interpreting Functions Algebra: Arithmetic with Polynomials and Rational Expressions Algebra: Seeing Structure in Expressions Algebra: Reasoning with Equations and Inequalities Geometry: Expressing Geometric Properties with Equations			
Concepts	focus, directrix, parabola, equations, transformations, expressions, structures, solutions, complex numbers, polynomial, quadratic, discriminant, zeros			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Mathematicians use the focus and directrix of a parabola to derive an equation. (MA10-GR.HS-S.4-GLE.3-EO.a.3)	How can you derive a quadratic equation from a focus and directrix?	Why does the focus and directix define a parabola?
The transformation of polynomial expressions and equations can eveal underlying structures and solutions. (MA10-GR.HS-S.2-GLE.3-EO.a, d, e)	What are the different ways to solve quadratic equations? How is factoring used to solve a polynomial with a degree greater than two? When is it appropriate to simplify expressions? (MA10-GR.HS-S.2-GLE.3-IQ.1)	How can polynomial identities be used to describe numerical relationships? Why is the remainder theorem useful?

Complex numbers provide solutions for quadratic equations where the discriminant is less than zero. (MA10-GR.HS-S.1-GLE.1-EO.c, d)	How do you perform operations on complex numbers? When does a quadratic equation have a complex solution? What is an imaginary number? Does every complex number have an imaginary component?	Why do the properties of operations for rational numbers hold for complex numbers? Why might imaginary numbers be useful outside of mathematics? Why are complex numbers important? (MA10-GR.HS-S.1-GLE.1-IQ.4) Why are there more complex numbers than real numbers? (MA10-GR.HS-S.1-GLE.1-IQ.2)

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real. (MA10-GR.HS-S.1-GLE.1-EO.c.i)
- Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. (MA10-GR.HS-S.1-GLE.1-EO.c.ii)
- Solve quadratic equations with real coefficients that have complex solutions. (MA10-GR.HS-S.1-GLE.1-EO.d.i)
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. (MA10-GR.HS-S.2-GLE.1-EO.c.iv)
- State and apply the remainder theorem. (MA10-GR.HS-S.2-GLE.3-EO.d.i)
- Identify zeros of quadratic, cubic, and quartic polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (MA10-GR.HS-S.2-GLE.3-EO.d.ii)
- Prove polynomial identities and use them to describe numerical relationships. (MA10-GR.HS-S.2-GLE.3-EO.e.i)
- Use the structure of a polynomial, rational or exponential expression to identify ways to rewrite it. (MA10-GR.HS-S.2-GLE.3-EO.a.ii)
- 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; recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. (MA10-GR.HS-S.2-GLE.4-EO.c.ii.2, 3)
- Derive the equation of a parabola given a focus and directrix. (MA10-GR.HS-S.4-GLE.3-EO.a.3)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*I know the roots of a quadratic equation are complex if the discriminant is negative.*
Academic Vocabulary:	solve, graph, identify, prove
Technical Vocabulary:	focus, directrix, parabola, equations, transformations, expressions, structures, solutions, complex numbers, polynomial, quadratic, discriminant, zeros, functions, Remainder theorem, imaginary number, roots, i, end behavior, factor, factorization, degree, derive, polynomial identities