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| **Unit Title** | Quadratics | **Length of Unit** | 22 days |
| **Focusing Lens(es)** | Students will understand that a quadratic function is a second degree polynomial represented graphically as a parabola. A relationship exists between a polynomial's factors, zeros, roots, and $x$-intercepts. | **North Carolina State Standards** | ***Cluster:*** *Defining complex numbers***N.CN.1*****Cluster:*** *Interpret the structure of expressions***A.SSE.1a-b, A.SSE.3*****Cluster:*** *Interpret functions that arise in applications in terms of a context***F.IF.4*****Cluster:*** *Analyze functions using different representations***F.IF.7, F.IF.8a, F.IF.9*****Cluster****:* *Build a function that models a relationship between two quantities***F.BF.1*****Cluster****:* *Build new functions from existing functions***F.BF.3*****Cluster:*** *Solve equations and inequalities in one variable***A.REI.4, A.REI.4a, A.REI.4b*****Cluster:*** *Solve systems of equations***A.REI.7*****Cluster:*** *Create equations that describe numbers or relationships***A.CED.1, A.CED.2, A.CED.3** |
| **Inquiry Questions (Engaging- Debatable):**  | 1. How might quadratic functions be used to model real-world situations?2. What information might the vertex of quadratic functions be able to provide?3. How are factoring and quadratic formula the same? How are they different?4. How can you manipulate quadratics? |
| **Unit Strands** | Expressions, Equations, Functions, and Quadratic Modeling |
| **Concepts** | Key features, Solving, and Transformations |

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| **Generalizations****My students will Understand that…** | **Guiding Questions** **Factual Conceptual** |
| It is important to interpret, compare, and analyze quadratics in different representations (tables, graphs, algebraic expressions, and verbal descriptions).**A.SSE.1a., A.SSE.1b, F.IF.4, F.IF.7, F.IF.9,** **A.REI.7** | What is the difference between axis of symmetry and vertex? | How can you identify and interpret quadratics? |
| Solve Quadratics algebraically using/by:* Factoring (M1)
* Square Root Method (M1)
* Quadratic Formula
* Completing the Square

**APR.1, N.CN.1, A.SSE.3, A.REI.4a, A.REI.4b,****A.REI.1, F.IF.8** | What are ways to solve quadratics?  | How can you determine which method to use to solve a quadratic function algebraically? |
| Transformations and Modeling of Quadratics**F.BF.1, F.BF.3, A.CED.1, A.CED.2, A.CED.3** | What is the main idea of modeling quadratic functions? | How would you create a new quadratic function? Justify your reasoning with a real world example. |

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| **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.* |
| * I can interpret key features of a quadratic in different representations
* I can compare two different functions each with a different representation
* I can analyze quadratic functions by generating different representations to show key features
* I can solve problems in a real-life context using different representations
* I can add, subtract, and multiply polynomials.
* I can solve quadratic equations by factoring.
* I can solve quadratic equations by taking the square root with real and complex $(a+bi)$ solutions.
* I can solve quadratic equations by completing the square with real and complex $(a+bi) $solutions.
* I can derive the quadratic formula by completing the square.
* I can solve quadratic equations using the quadratic formula with real and complex $(a+bi)$ solutions.
* I can find the resulting graphs when $f(x)$ goes through the following transformations: $k \*f(x)$, $f(x) +k$, $f(x+k)$
* I can write an equation that models a given quadratic situation.
* I can express any quadratic in vertex and standard form.
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| **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):**  | 1. Create and interpret quadratic functions with multiple representations.
2. Use quadratic models to analyze and transform functions.
3. Make and evaluate different representations of quadratic functions.
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| **Vocabulary:** | axis of symmetry of a parabola, concave down, concave up, constraints, decreasing function, system of equations, transformation, algebraic inequality, axis of symmetry of a parabola, binomial, closed interval, complex number system, complex numbers, concavity, constant term, decreasing, discriminant, end behavior, even function, explicit function, expression, extrema, factor, first difference, half-closed interval, half-open interval, imaginary number, imaginary unit i,increasing, increasing function, infinity, intercept form (factored form), interval, irrational numbers, like terms, linear function, maximum, minimum, monomial, neither (odd or even), odd, function, open interval, parabola, points of intersection, polynomial, quadratic expression, quadratic function, quadratic equation, quadratic-linear system, quadratic-quadratic system, range, rational numbers, real numbers, restricted domain, restricted range, root, second difference, slope, standard form of a quadratic function, system of equations, term, translations, trinomial, variable, vertex form, vertex of a parabola, wholly, imaginary, wholly real, x-intercepts, y-intercept, zero |