WAKE COUNTY PUBLIC SCHOOL SYSTEM

Middle School Programs
Building Healthy Core Learning
Common Core Math I, Unit 6

Math I UNIT 6 OVERVIEW: Quadratic Functions

Unit Outcomes At the end of this unit, your student should be able to:	**Key Vocabulary** Terms to deepen the student's understanding
✓ Determine whether an expression is a polynomial ✓ Add, subtract, multiply polynomials (limit to addition and subtraction of quadratics and multiplication of linear expressions). ✓ Identify the coefficients and constants of a quadratic function and interpret them in a contextual situation. ✓ Sketch the graph of a quadratic function and interpret key features in context, including domain, range, intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximum or minimum; and symmetry. ✓ Determine if a function is a quadratic function. ✓ Use quadratic functions to model relationships between two quantities. ✓ Factor a quadratic expression to reveal the zeros of the graph of the function. ✓ Given a quadratic function in context, determine the practical domain of the function (input values that make sense to the constraints of the problem context). ✓ Recognize equivalent forms of quadratic functions. For example, standard form $y = ax^2+bx+c$, and factored form $y = a(x - r_1)(x - r_2)$. ✓ Compare properties of two quadratics each represented in a different way (algebraically, graphically, numerically in tables, or by verbal description).	✓ Axis of Symmetry ✓ Binomial ✓ Constant ✓ Degree of a monomial ✓ Degree of a polynomial ✓ Difference of Squares ✓ Extreme Values ✓ Factoring ✓ Greatest Common Factor ✓ Intercepts ✓ Intervals where Increasing, Decreasing, Positive or Negative ✓ Linear expression ✓ Monomial ✓ Polynomial ✓ Relative Maximum or Minimum ✓ Solutions ✓ Standard form of a polynomial ✓ Symmetry ✓ Trinomial ✓ Vertex ✓ x-intercepts of a Quadratic Function ✓ Zeros
Key Standards Addressed Connections to Common Core/NC Essential Standards	**Where This Unit Fits** Connections to prior and future learning
N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays **A-APR.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. **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-SSE.1** 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. **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. Factor a quadratic expression to reveal the zeros of the function it defines. *Note: At this level, the limit is quadratic expressions of the form $ax^2 + bx + c$.* **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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Note: At this level, focus on linear, exponential and quadratic functions; no end behavior or periodicity.*	**Coming into this unit, students should have a strong foundation in:** ✓ Solving one variable equations ✓ Graphing linear functions ✓ Linear and exponential functions ✓ Finding the GCF of integers ✓ Combining like terms ✓ The Distributive Property ✓ Identifying key features of a function from a graph **This unit builds to the following future skills and concepts:** ✓ Factoring quadratic equations with a leading coefficient other than one ✓ Solving systems of equations ✓ Graphing and analyzing more complex functions (including inverse, step, exponential, absolute value, trigonometric and logarithmic functions)

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F-IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. Note: At this level, focus on linear and exponential functions.*
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.

F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

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. ***Note:*** *At this level, only factoring expressions of the form ax2 + bx +c, is expected. Completing the square is not addressed at this level.*

F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. Note: At this level, focus on linear, exponential, and quadratic functions.*
F-BF.1 Write a function that describes a relationship between two quantities.
F-LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. *Note: At this level, limit to linear, exponential, and quadratic functions; general polynomial functions are not addressed.*

- ✓ Using regression models to predict linear, quadratic and exponential models
- ✓ Understanding, graphing, and writing transformations of quadratic parent functions
- ✓ Using the Quadratic Formula to solve quadratic functions

Additional Resources Materials to support understanding and enrichment	**"Learning Checks"** Questions Parents Can Use to Assess Understanding
✓ Quadratic equations overview (notes) ✓ Quadratic equation solver ✓ Factoring overview (video) ✓ Graphing quadratic equations (video) ✓ Factoring GCF (practice) ✓ Factor quadratics when a=1 (practice) ✓ Factor quadratics with a leading coefficient (practice) ✓ Factoring special cases (practice)	✓ How do the coefficients determine the shape and the location of the graph of a quadratic function? ✓ What patterns of change are associated with quadratic functions? ✓ When is it appropriate to use a quadratic function to model the relationship between two quantities? ✓ How do you determine the best model for a data pattern?