Math I UNIT 5 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
• Use function notation to evaluate a quadratic function given a value in the domain. • Interpret the contextual meaning of a given point from a quadratic function in function notation. • Interpret the meaning of the independent and dependent variables in context of a quadratic function. • Interpret contextual significance of the domain and range of a quadratic function • State the domain and range of a quadratic function from its graph. • Interpret and analyze key features of a quadratic function in context including positive/negative, increasing/decreasing, intercepts, maximum/minimum and domain/range when given the function as a table, graph, and/or verbal description. • Use mathematical reasoning to justify a chosen solution method for a quadratic equation. • Use mathematical reasoning to justify each step of the solving process for a quadratic equation. • Identify the terms, factors and coefficients of a quadratic expression. • Interpret the terms, factors and coefficients of a quadratic expression in terms of the context. • Create an equation in two variables to represent a quadratic relationship between two quantities. • Graph a quadratic equation that represents a relationship between two quantities. • Choose an appropriate domain and range for a quadratic function. • Identify the maximum and minimum of quadratic functions. • Identify where a quadratic function is increasing and decreasing. • Compare two quadratic functions symbolically, graphically, verbally, and using tables. • Compare linear and quadratic functions symbolically, graphically, verbally, and using tables. • understand that the x-intercepts/solutions/zeros/roots can be determined by factoring for some quadratic functions. • Build a quadratic function by multiplying linear equations and combining two quadratic equations with addition and subtraction.	• Axis of Symmetry • Binomial • Constant • Degree of a Monomial • Degree of a Polynomial • Difference of Squares • Extreme Values • Factoring • Initial Height • Initial Velocity • Intercepts • Intervals where increasing, decreasing, positive or negative • Linear Expression • Monomial • Parabola • Polynomial • Relative Maximum or Minimum • Roots • Solutions • Standard Form of a Polynomial • Symmetry • Trinomial • Vertex • x-intercepts of a Quadratic Function • Zeros

Math I UNIT 5 OVERVIEW: Quadratic Functions

Key Standards Addressed Connections to Common Core/NC Essential Standards	**Where This Unit Fits** Connections to prior and future learning
NC.M1.A-SSE.1 Interpret expressions that represent a quantity in terms of its context. a. Identify and interpret parts of a linear, exponential, or **quadratic** expression, including terms, factors, coefficients, and exponents. b. Interpret a linear, exponential, or **quadratic** expression made of multiple parts as a combination of entities to give meaning to an expression. **NC.M1.A-SSE.3** Write an equivalent form of a quadratic expression, □□^{2} + □x+ □, where *a* is an integer, by factoring to reveal the solutions of the equation or the zeros of the function the expression defines. **NC.M1.A-APR.1** Build an understanding that operations with polynomials are comparable to operations with integers by adding and subtracting quadratic expressions and by adding, subtracting, and multiplying linear expressions. **NC.M1.A-APR.3** Understand the relationships among the factors of a quadratic expression, the solutions of a quadratic equation, and the zeros of a quadratic function. **NC.M1.A-CED.2** Create and graph equations in two variables to represent linear, exponential, and quadratic relationships between quantities. **NC.M1.A-REI.1** Justify a chosen solution method and each step of the solving process for linear and **quadratic** equations using mathematical reasoning. **NC.M1.A-REI.4** Solve for the real solutions of quadratic equations in one variable by taking square roots and factoring. **NC.M1.A-REI.11** Build an understanding of why the *x*-coordinates of the points where the graphs of two linear, exponential, and/or quadratic equations □ = *f*(x) and □ = *g*(x) intersect are the solutions of the equation *f*(x) = □(x) and approximate solutions using graphing technology or successive approximations with a table of values. **NC.M1.F-IF.2** Use function notation to evaluate linear, **quadratic**, and exponential functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**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 • Graphing and analyzing more complex functions (including inverse, step, exponential, absolute value, trigonometric and logarithmic functions)

Math I UNIT 5 OVERVIEW: Quadratic Functions

NC.M1.F-IF.4 Interpret key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities, including: intercepts; intervals where the function is increasing, decreasing, positive, or negative; and maximums and minimums. **NC.M1.F-IF.5** Interpret a function in terms of the context by relating its domain and range to its graph and, where applicable, to the quantitative relationship it describes. **NC.M1.F-IF.6** Calculate and interpret the average rate of change over a specified interval for a function presented numerically, graphically, and/or symbolically. **NC.M1.F-IF.7** Analyze linear, exponential, and quadratic functions by generating different representations, by hand in simple cases and using technology for more complicated cases, to show key features, including: domain and range; rate of change; intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and end behavior. **NC.M1.F-IF.8** Use equivalent expressions to reveal and explain different properties of a function. a. Rewrite a quadratic function to reveal and explain different key features of the function **NC.M1.F-IF.9** Compare key features of two functions (linear, quadratic, or exponential) each with a different representation (symbolically, graphically, numerically in tables, or by verbal descriptions). **NC.M1.F.BF.1** Write a function that describes a relationship between two quantities. b. Build a function that models a relationship between two quantities by combining linear, exponential, or quadratic functions with addition and subtraction or two linear functions with multiplication. **NC.M1.F-LE.3** Compare the end behavior of linear, exponential, and quadratic functions using graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.	

Math I UNIT 5 OVERVIEW: Quadratic Functions

Additional Resources Materials to support understanding and enrichment	**"Learning Checks"** Questions Parents Can Use to Assess Understanding
• Teaching Videos made by Wake County teachers • 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 can projectile motion be modeled using a quadratic function? • How does knowing the definition of a maximum or minimum help you visualize the graph of a quadratic function? • How do you determine which solution to use for a quadratic equation? • How is factoring connected to the distributive property? • How can I compare operations with integers to operations with quadratic expressions? • What types of information are contained in various forms of a quadratic function?

*** Please note**, the unit guides are a work in progress. If you have feedback or suggestions on improvement, please feel free to contact wakemiddle@wcpss.net.