Mathematics **Brunswick School Department**

Algebra II: CP
Quadratic Functions

Essential Understandings	▪ Quadratic functions can be used to model real-life situations.
Essential Questions	▪ What are the properties of Algebra and how are these used to solve quadratic equations? ▪ What types of data are modeled by quadratic equations? ▪ How do transformations affect the graph of the quadratic? ▪ How do you solve quadratics that have complex roots? ▪ How do you solve and graph quadratic inequalities?
Essential Knowledge	▪ Factoring, completing the square and the quadratic formula are used to solve quadratic equations. ▪ Transformations change the location and shape of quadratic graphs. ▪ Complex numbers are used to solve quadratics with non-real roots. ▪ Solve quadratic inequalities by using tables, graphs and algebra.
Vocabulary	▪ <u>Terms</u>: o quadratic function, parabola, Y-intercept, X-intercept, transformations, vertex, maximum and minimum values, discriminant, zero product rule, zero or root of a function, the imaginary number, complex numbers
Essential Skills	▪ Apply order of operation. ▪ Use properties of equalities and inequalities to write and solve quadratic functions. ▪ Graph quadratic equations and inequalities. ▪ Interpret the real world meaning of the vertex and intercepts.

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Related Maine Learning Results	Mathematics A. Number Real Number A1. Students will know how to represent and use real numbers. a. Use the concept of nth root. b. Estimate the value(s) of roots and use technology to approximate them. c. Compute using laws of exponents. d. Multiply and divide numbers expressed in scientific notation. e. Understand that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations. B. Data Measurement and Approximation B1. Students understand the relationship between precision and accuracy. a. Express answers to a reasonable degree of precision in the context of a given problem. b. Represent an approximate measurement using appropriate numbers of significant figures. c. Know that most measurements are approximations and explain why it is useful to take the mean of repeated measurements. C. Geometry Geometric Figures C1. Students justify statements about polygons and solve problems. a. Use the properties of triangles to prove theorems about figures and relationships among figures. b. Solve for missing dimensions based on congruence and similarity. c. Use the Pythagorean Theorem in situations where right triangles are created by adding segments to figures. d. Use the distance formula. C2. Students justify statements about circles and solve problems. a. Use the concepts of central and inscribed angles to solve problems and justify statements. b. Use relationships among arc length and circumference, and areas of circles and sectors to solve problems and justify statements. C3. Students understand and use basic ideas of trigonometry. a. Identify and find the value of trigonometric ratios for angles in right triangles. b. Use trigonometry to solve for missing lengths in right triangles. c. Use inverse trigonometric functions to find missing angles in right triangles.

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Related Maine Learning Results	D. Algebra Symbols and Expressions D1. Students understand and use polynomials and expressions with rational exponents. a. Simplify expressions including those with rational numbers. b. Add, subtract, and multiply polynomials. c. Factor the common term out of polynomial expressions. d. Divide polynomials by (ax+b). Equations and Inequalities D2. Students solve families of equations and inequalities. a. Solve systems of linear equations and inequalities in two unknowns and interpret their graphs. b. Solve quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula. c. Solve simple rational equations. d. Solve absolute value equations and inequalities and interpret the results. e. Apply the understanding that the solution(s) to equations of the form f(x) = g(x) are x-value(s) of the point(s) of intersection of the graphs of f(x) and g(x) and common outputs in table of values. f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this understanding to solving problems. D3. Students understand and apply ideas of logarithms. a. Use and interpret logarithmic scales. b. Solve equations in the form of $x + b^{y}$ using the equivalent form $y = \log_b x$. Functions and Relations D4. Students understand and interpret the characteristics of functions using graphs, tables, and algebraic techniques. a. Recognize the graphs and sketch graphs of the basic functions. b. Apply functions from these families to problem situations. c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values. d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare functions.

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Related Maine Learning Results	D5. Students express relationships recursively and use iterative methods to solve problems. a. Express the (n+1)st term in terms of the nth term and describe relationships in terms of starting point and rule followed to transform one terms to the next. b. Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.
Sample Lessons And Activities	▪ Solve quadratic equations using a variety of techniques. These include graphing, factoring, completing the square, the quadratic formula and technology. ▪ Graph and determine the roots and vertex of quadratic functions.
Sample Classroom Assessment Methods	▪ Evaluate homework. ▪ Quizzes. ▪ Chapter test.
Sample Resources	▪ <u>Publications:</u> o McDougal Littell Algebra 2 ▪ <u>Other Resources:</u> o Graphing calculators. o The A+ learning system for remediation.