

06_Quadratic Functions and Equations

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **5 weeks (18-20 blocks)**
Status: **Published**

General Overview, Course Description or Course Philosophy

This unit will focus on strengthening the prerequisite skills and conceptual understanding needed to graph quadratic functions and solve quadratic equations. Lesson activities will reinforce new content and address common misconceptions and errors to support students' progress toward graphing quadratic functions and solving quadratic equations.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives/Enduring Understandings:

Students will understand that:

- Key features of quadratic functions can be used to graph quadratic functions and model real-world problems
- Every quadratic function is a transformation of the parent function $y=x^2$
- Quadratic equations can be solved graphically, algebraically, and numerically

Essential Questions:

- How can you use sketches and equations of quadratic functions to model situations and make predictions?
- How is the standard form of a quadratic function different from the vertex form?

CONTENT AREA STANDARDS

MA.F-IF.B.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.
MA.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-IF.C.8a	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.
MA.K-12.2	Reason abstractly and quantitatively.

MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
MA.A-REI.B.4a	Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
MA.A-REI.B.4b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 $a \pm bi$ for real numbers a and b .
MA.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.A-SSE.B.3b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Quadratic functions can be graphed using key features (intercepts, minimums/maximums, symmetries)
- Quadratic equations can be solved using various methods (graphing, using square roots, factoring, completing the square, quadratic formula)
- The initial form of the quadratic equation determines which method to use when solving
- The discriminant can be used to determine when the quadratic formula will have complex solutions

Procedural Knowledge

Students will be able to:

- Sketch the graph of a quadratic function using key features
- Determine the range of a quadratic function in different forms
- Match the zeros (x-intercepts) of a given graph to the corresponding function
- Factor polynomials using various techniques
- Find the zeros (x-intercepts) of a polynomial function when suitable factorizations are available
- Solve quadratic equations using the methods of graphing, using square roots, factoring, completing the square, and quadratic formula
- Use the process of factoring to symbolically manipulate quadratic functions in different forms (e.g., standard form, factored form, vertex form)
- Complete the steps of the mathematical modeling cycle

EVIDENCE OF LEARNING

Formative Assessments

- Student daily participation
- Student self-assessment
- Skills checklist
- Student-friendly proficiency scales
- Teacher feedback

Summative Assessments

- Assessment Reflection

RESOURCES (Instructional, Supplemental, Intervention Materials)

- Kuta Software
- Quizizz
- Desmos
- Delta Math
- Nearpod
- Khan Academy
- Assessment Reflection

INTERDISCIPLINARY CONNECTIONS

- The graphs of quadratic functions have various applications in physics
- Solving quadratic equations can be used to analyze real-world situations in a variety of contexts

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.