# Unit 2 Quadratic Forms

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 1**
Length: **2-3 weeks**
Status: **Published**

## Brief Summary of Unit

In this unit, students will focus on the characteristics of a quadratic graph and equation. The first section explores the different transformations previously learned now applied to a quadratic equation, and how this form can connect to the standard equation. In the second section, the students will be introduced to the third type of quadratic equation, and its defining features. They will also learn how to find characteristics of the quadratic graph such as the axis of symmetry and the vertex from all three forms, as well as the minimum/maximum with either increasing or decreasing sections. Finally, students will study the real-life implications of quadratics by modeling data. This also includes discussing quadratic regression to find the best fit curve.

**Revision Date:** July 2024

## Standards

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| 9.2.12.CAP.3 | Investigate how continuing education contributes to one's career and personal growth. |
| L.KL.9–10.2.A | Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level. |
| 9.2.12.CAP.6 | Identify transferable skills in career choices and design alternative career plans based on those skills. |
| F.BF.B.3 | Identify the effect on the graph of replacing □(□) by □(□) + □, □ □(□), □(□□), and □(□ + □) for specific values of □(both positive and negative); find the value of □ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. |
| A.CED.A.2 | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. |
| 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. |
| F.IF.B.6 | Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
| F.IF.C.7.c | Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. |
| F.IF.C.9 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).<br><br>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. |

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| SL.PE.11–12.1.A | Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. |

## Essential Questions

- How can transformations lead to knowing a quadratic's distinguishing characteristics?
- How can you model a quadratic function in a real-life example?
- What algebra must you know in order to transition from vertex form to standard form?
- What are distinguishing characteristics of the intercept from? Are any of them similar to the other forms?
- What information is needed to use quadratic regression? How can this be useful?

## Enduring Understandings

- Describe and graph transformations of quadratic functions.
- Write equations of quadratic functions using given characteristics.

## Students Will Know

- Characteristics of quadratic functions.
- How to describe transformations of quadratic functions.
- How to write equations of parabolas.
- Modeling with quadratic functions.

## Students Will Be Skilled At

- Describing transformations of quadratic functions.
- Graphing transformations of quadratic functions.
- Identifying characteristics of quadratic functions and their graphs.
- Using characteristics of quadratic functions to solve real-life problems.
- Using properties of parabolas to graph quadratic functions.
- Using technology to find a quadratic model for a set of data.
- Writing equations of quadratic functions using vertices, points, and x-intercepts.
- Writing functions that represent transformations of quadratic functions.
- Writing quadratic equations to model data sets.

## Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

## Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Solve real-world application problems. Analyze the solutions in terms of the context.
- Building off the transformations from Unit 1, students should recognize this form of the quadratic function as the vertex form. Students will be able to find the vertex, axis of symmetry, and y-intercept from this form.
- Finally, students will be introduced to the intercept form. Students will be able to find the vertex, axis of symmetry, and x-intercepts from this form. At this time, point out that all forms have either a minimum or maximum as the vertex. Depending on which, the function is first increasing then decreasing or vice versa.
- Students will use their knowledge of simplifying a function to simplify the vertex from into standard form (ax^2+bx+c). Students will again be able to find the vertex, axis of symmetry, and y-intercept from this form.
- Students will likely need additional time to practice finding the characteristics from each of these forms.
- Now, the students should have a strong idea of these functions along with the characteristics, and can apply them to real-life modeling situations.
- Referring back to their knowledge of linear regression from Unit 1, expand this to quadratic regression on a calculator.
- Students will likely need additional time to practice using the calculator to find the best fit curve for given data.

## Materials

Core instructional materials:Core Book List including Big Ideas Math Algebra 2 2022

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes

## Suggested Strategies for Modifications

Possible accommodations/modification for Algebra 2