

# Mar. BI Alg. I Unit 8: Graphing Quadratic Functions

Content Area: **Math**  
Course(s):  
Time Period: **March**  
Length: **6-8 Weeks**  
Status: **Published**

## Unit Overview

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- Graphing  $f(x)=ax^2$
- Graphing  $f(x)=ax^2+c$
- Graphing  $f(x)=ax^2+bx+c$
- Graphing  $f(x)=a(x-h)^2+k$
- Using Intercept Form
- Comparing Linear, Exponential, and Quadratic Functions

## Enduring Understandings

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SWBAT:

- Identify characteristics of quadratic functions
- Graph and use quadratic functions of the form  $f(x)=ax^2$
- Graph quadratic functions of the form  $f(x)=ax^2+c$
- Solve real-life problems involving quadratic functions
- Graph quadratic functions of the form  $f(x)=ax^2+bx+c$
- Find minimum and maximum values of quadratic functions
- Identify even and odd functions
- Graph quadratic functions of the form  $f(x)=a(x-h)^2$  and  $f(x)=a(x-h)^2+k$
- Model real-life problems using  $f(x)=a(x-h)^2+k$
- Graph quadratic functions of the form  $f(x)=a(x-p)(x-q)$
- Use intercepts form to find zeros of functions
- Use characteristics to graph and write quadratic functions
- Use characteristics to graph and write cubic functions
- Choose functions to model data
- Write functions to model data
- Compare functions using average rates of change
- Solve real-life problems involving different function types

## Essential Questions

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- What are some of the characteristics of the graph of a quadratic functions of th form  $f(x)=ax^2$ ?

- How do we graph a quadratic equation of the form  $f(x)=ax^2$ ?
- How does the value of  $c$  affect the graph of  $f(x)=ax^2+c$ ?
- How do we graph a quadratic function of the form  $f(x)=ax^2+c$ ?
- How can we find the vertex of the graph of  $f(x)=ax^2+bx+c$ ?
- How do we graph a quadratic function of the form  $f(x)=ax^2+bx+c$ ?
- How can you describe the graph of  $f(x)=a(x-h)^2$ ?
- What are some of the characteristics of the graph of  $f(x)=a(x-p)(x-q)$ ?
- How can you compare the growth rates of linear, exponential, and quadratic functions?

## Instructional Strategies & Learning Activities

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- Guided Practice
- Do Now
- Extra Practice & Puzzle Time (Resources)
- Scavenger Hunts
- Coloring Activities
- Task Cards (Around the World)
- Maze Activities
- Quizizz Online Assignments
- Kahoot! Online Games

## Integration of Career Readiness, Life Literacies and Key Skills

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WRK.9.2.8.CAP	Career Awareness and Planning
WRK.9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
WRK.9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
WRK.9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
WRK.9.2.8.CAP.4	Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
WRK.9.2.8.CAP.10	Evaluate how careers have evolved regionally, nationally, and globally.
WRK.9.2.8.CAP.12	Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
TECH.9.4.8.CT	Critical Thinking and Problem-solving

TECH.9.4.8.DC.5	Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure.
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.GCA	Global and Cultural Awareness
TECH.9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
TECH.9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
TECH.9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
TECH.9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
TECH.9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
TECH.9.4.8.IML.12	Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.  There are variety of resources available to help navigate the career planning process.  An individual's strengths, lifestyle goals, choices, and interests affect employment and income.

## Technology and Design Integration

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CS.6-8.8.1.8.CS.4	Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.
CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.1.8.DA.2	Explain the difference between how the computer stores data as bits and how the data is displayed.
CS.6-8.8.1.8.DA.3	Identify the appropriate tool to access data based on its file format.
CS.6-8.8.1.8.IC.1	Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options.
CS.6-8.8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
CS.6-8.8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.

## Interdisciplinary Connections

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LA.RI.8	Reading Informational Text
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LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
LA.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
LA.W.8.1.A	Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
LA.W.8.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
LA.W.8.1.D	Establish and maintain a formal style.
LA.W.8.1.E	Provide a concluding statement or section that follows from and supports the argument presented.
LA.SL.8.1.C	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
LA.SL.8.1.D	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

## Differentiation

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- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.
- **Definitions of Differentiation Components:**
  - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
  - Process – how the student will acquire the content information.
  - Product – how the student will demonstrate understanding of the content.
  - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

### **Differentiation occurring in this unit:**

Additional support for struggling learners will be available.

Challenges will be offered to students requiring additional depth of knowledge.

## **Modifications & Accommodations**

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Refer to QSAC EXCEL SMALL SPED ACCOMMODATIONS spreadsheet in this discipline.

### **Modifications and Accommodations used in this unit:**

IEP and 504 accommodations will be utilized.

## **Benchmark Assessments**

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**Benchmark Assessments** are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

### **Schoolwide Benchmark assessments:**

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

### **Additional Benchmarks used in this unit:**

## **Formative Assessments**

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Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

### **Formative Assessments used in this unit:**

- Kahoot! Games
- Quizizz Games
- Homework
- Q & A
- Scavenger Hunts
- Coloring Activities
- Task Cards

- Partner Activities

## Summative Assessments

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**Summative assessments** evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

**Summative assessments for this unit:**

- Chapter Tests
- Quizzes









## Instructional Materials

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1. Big Ideas Math: Algebra 1: A Common Core Curriculum
2. Quizizz
3. Kahoot
4. Scavenger Hunts
5. Task Cards
6. Coloring Activities
7. Resources Book
8. Scientific Calculator
9. Graphing Calculator

## Standards

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|---|-----------------------|---|
|  | CCSS.Math.Content.HSA | Identify zeros of polynomials when suitable factorizations  |
|  | 0x-APR.B.3            | are available, and use the zeros to construct a rough graph |
|  |                       | of the function defined by the polynomial.                  |
|  | CCSS.Math.Content.HSA | Factor a quadratic expression to reveal the zeros of the    |
|  | 0x-SSE.B.3.a          | function it defines.  |
|  |                       |   |
|  | CCSS.Math.Content.HSF | Determine an explicit expression, a recursive process, or   |
|  | 0x-BF.A.1.a           | steps for calculation from a context.                       |



0x CCSS.Math.Content.HSF  
-BF.B.3

Identify the effect on the graph of replacing  $f(x)$  by  $f(x) + k$ ,  $k f(x)$ ,  $f(kx)$ , and  $f(x + k)$  for specific values of  $k$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.



0x CCSS.Math.Content.HSF  
-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.



0x CCSS.Math.Content.HSF  
-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.



0x CCSS.Math.Content.HSF  
-IF.C.7.a

Graph linear and quadratic functions and show intercepts, maxima, and minima.



0x CCSS.Math.Content.HSF  
-IF.C.8.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.



0x CCSS.Math.Content.HSF  
-IF.C.9

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).



0x CCSS.Math.Content.HSF  
-LE.A.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.

