

Updated:
 November 2021

Marking Period	Unit Title	Recommended Instructional Days
TBD	Algebra 1 – Quadratic Modeling – Unit 3 - Module B	15 - 20 days
Conceptual Category: FUNCTIONS and ALGEBRA Domain: Interpreting Functions, Reasoning with Equations and Inequalities, Create Equations		Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit <u>Essential Question(s):</u> 1. What key features are shared among the square root function and translation to the square function?(F-IF.B.4) 2. How can you identify and use intercepts in linear relationships? (F-IF.B.4) 3. How can you describe a relationship given a graph and sketch a graph given a description? (F-IF.B.5) 4. How can you relate the rate of change and slope in linear relationships? (F-IF.B.6) 5. How does factoring help you solve quadratic equations? (A.REI.B.4) 6. How do you use an equation to model and solve a real-world problem? (A-CED.A.1) 7. How can you solve a compound inequality and graph the solution set? (A-CED.A.1) 8. How can you solve equations involving variable exponents?(A-CED.A.1) <u>Activity Description(s):</u> 1. Sketch the graph of each function. 2. Identify the domain and range.

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| | | <ol style="list-style-type: none">3. Compare rate of change of two functions.4. Reasoning with equations and inequalities.5. Solve equations and inequalities in one variable.6. Solve quadratic equations in one variable.7. Creating Equations That Describe Numbers or Relationships.8. Create equations that describe numbers or relationships. |
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■ **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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

■ **F.IF.B.5.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function*

■ **F.IF.B.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a

- See example tasks below:

Task 1 (F.IF.B.4 & F.IF.B.5):

Mike likes to canoe. He can paddle 150 feet per minute. He is planning a river trip that will take him to a destination about 30,000 feet upstream (that is, against the current). The speed of the current will work against the speed that he can paddle.

- a. Let s be the speed of the current in feet per minute. Write an expression for $r(s)$, the speed at which Mike is moving relative to the river bank, in terms of s .
- b. Mike wants to know how long it will take him to travel the 30,000 feet upstream. Write an expression for $T(s)$, the time in minutes it will take, in terms of s .
- c. What is the vertical intercept of T ? What does this point represent in terms of Mike's canoe trip?
- d. At what value of s does the graph have a vertical asymptote? Explain why this makes sense in the situation.
- e. For what values of s does $T(s)$ make sense in the context of the problem?

Source: Illustrative Mathematics
Answer Key

table) over a specified interval. Estimate the rate of change from a graph.

■ **A.REI.B.4** Solve quadratic equations in one variable.

a. 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.

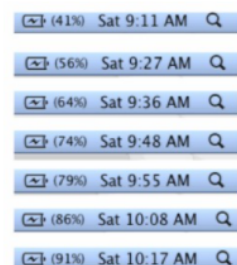
Derive the quadratic formula from this form.

b. 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 .

■ **A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

Task 2 (F.IF.B.6.):

Jerry forgot to plug in his laptop before he went to bed. He wants to take the laptop to his friend's house with a full battery. The pictures below show screenshots of the battery charge indicator after he plugs in the computer.



- When can Jerry expect that his laptop battery is fully charged?
- At 9:27 AM Jerry makes a quick calculation:

The battery seems to be charging at a rate of 1 percentage point per minute. So the battery should be fully charged at 10:11 AM.

Explain Jerry's calculation. Is his estimate most likely an under- or over-estimate? How does it compare to your prediction?

- Compare the average rate of change of the battery charging function on the first given time interval and on the last given time interval. What does this tell you about how the battery is charging?
- How long would it take for the battery to charge if it started out completely empty?

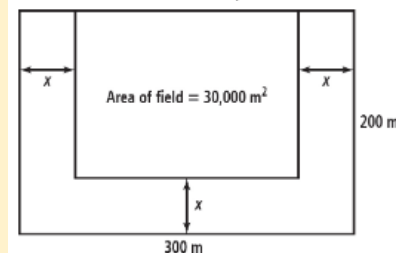
[Source: Illustrative Mathematics](#)
[Answer Key](#)

Key:

- Major Cluster
- ▣ Supporting Cluster
- Additional Cluster

Task 3 (A.REI.B.4):

A soccer field is bordered on three sides by a parking lot of width x . The total length of the field and parking lot is 300 m, and the total width is 200 m. The area of the field is $30,000 \text{ m}^2$. How wide is the parking lot?



Source: Envision Algebra I - Savvas Learning
[Answer Key](#)

Task 4 (A.CED.A.1) :

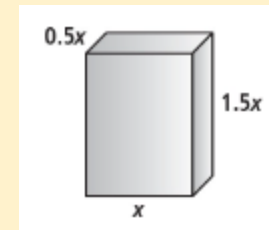
Chase and his brother like to play basketball. About a month ago they decided to keep track of how many games they have each won. As of today, Chase has won 18 out of the 30 games against his brother.

- a. How many games would Chase have to win in a row in order to have a 75% winning record?
- b. How many games would Chase have to win in a row in order to have a 90% winning record?
- c. Is Chase able to reach a 100% winning record? Explain why or why not.
- d. Suppose that after reaching a winning record of 90% in part (b), Chase had a losing streak. How many games in a row would Chase have to lose in order to drop down to a winning record below 55% again?

Source: Illustrative Mathematics
[Answer Key](#)

Interdisciplinary Connections:

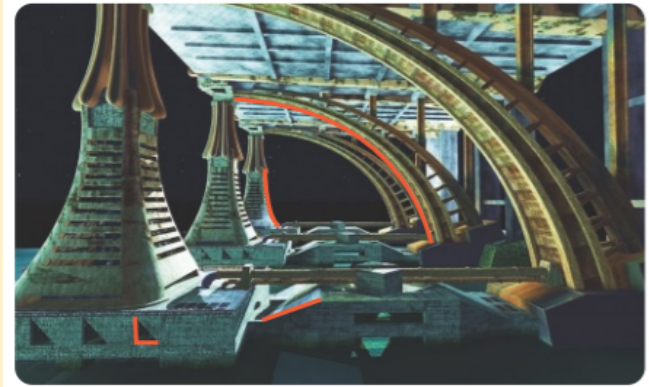
- (F.IF.B.5) The function $f(x) = 2.75x^2$ models the packaging costs, in cents, for shipping a book with the side lengths, in inches, shown in the diagram. What are reasonable domain and range values for this function?



Answer Key

domain: $4 \leq x \leq 12$; range: $44 \leq f(x) \leq 396$

- (F.IF.B.4) Model With Mathematics: Yumiko is an animator. She uses computer-generated imagery (CGI) to create scenes for a movie. The shapes and features she uses are defined by functions. Which features of functions will be useful for Yumiko, and how can she use them in her work?



Answer Key

Axes of symmetry will save Yumiko work because she can draw half of the image and then reflect it. Maximum and minimum values might be helpful in setting up edges of shapes.

Content(s): Life & Careers, Engineering Design
NJSLS#: CAEP.9.2.12.C.6; 9-12.HS-ETS1-2.6.1

Highlight on:

Charts, Maps, and Graphs Lesson on the Holocaust

Students practice interpreting data. In this Holocaust lesson, students research selected Internet sources and examine charts, maps, and graphs regarding the Jewish populations in and out of Europe. Students respond to questions about the data.

Mathematics Practices

1. Make sense of problems and persevere in solving them.

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2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.		
Social and Emotional Learning:	Social and Emotional Learning:	
<i>Competencies</i>	<i>Sub-Competencies</i>	
Self-Awareness Social Awareness Self-Management Relationship Skills Responsible Decision-Making	Recognizing the importance of self-confidence in handling daily tasks and challenges. Demonstrate an awareness of the expectations for social interactions in a variety of ways. Demonstrate an understanding of the need for mutual respect when viewpoints differ. Recognize the skills needed to establish and achieve personal and educational goals. Utilize positive communication and social skills to interact effectively with others. Develop, implement, and model effective problem solving and critical thinking skills.	
Assessments (Formative)		Assessments (Summative)

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To show evidence of meeting the standard/s, students will successfully engage within:		To show evidence of meeting the standard/s, students will successfully complete:	
Formative Assessments: ● Entry and Exit Slips ● Homework and Classwork ● Quizzes ● Self Assessments		Benchmarks: ● Tests ● Projects Other Summative Assessments: ● District Assessments ● Midterm and/or Final Exams ● Standardized Tests	
Differentiated Student Access to Content: Teaching and Learning <i>Resources/Materials</i>			
Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core Resources
● Textbooks websites resources ● Khan Academy ● Desmos ● IXL Learning ● Understanding ELLs ● GeoGebra ● Edulastic ● Illustrative Math ● Achieve the core ● NJDOE resources	● Skill building worksheets ● Math Manipulatives ● Guided notes ● Guided Practice ● (other alternate core resources)	● Bilingual editions, if available ● Dictionary for native languages ● Videos in students’ native language. ● Mathematical Literacy and vocabulary activity ● (other ELL resource)	● Leveled Assessments ● Enrichment Activities ● (other G&T resources)
Supplemental Resources			
Technology: ● Chromebooks, Scientific and Graphing Calculators, Online Math Activities (Desmos, Digital interactive notebooks, Kahoot, Edulastic, Quizlet, Kuta Software, BOOM Cards, EDPUZZLE, Thatquiz.org, QUIZZZ, BLOOKET, JAMBOARD, Peardecks, Nearpod, Socrative, IXL Diagnostic Arena, Prodigy, etc.) Other: ● Google Meets or Zoom, Google Classroom, Interactive Textbooks			
Differentiated Student Access to Content: Recommended <i>Strategies & Techniques</i>			

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Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core
- Deliver instruction for varied learning styles (auditory, visual, tactile/kinesthetic, etc) - Provide individual instruction as needed - Modify assessments and/or rubrics as needed.	- Utilize a multi-sensory (VAKT) approach during instruction - Provide alternatives to skill development by varying the methods (repetition, simple explanations, additional examples, modeling, etc.) - Modify test content and/or format - Allow students to retake or correct tests for additional credit - Provide additional time and preferential seating as needed - Review, restate and repeat directions - Provide study guides, and/or break assignments into segments or shorter tasks, etc.	- Extend allowable time if possible and as needed - Preferred seating - Positive reinforcement - Check often for understanding - Oral/visual directions/prompts when necessary - Supplemental materials (ie. online bilingual dictionary) - Modified assessments and/or rubrics Other Accommodations and Modifications for ESL (Source: https://studylib.net/doc/6610362/general-accommodations-and-modifications-checklist)	- Create an enhanced set of introductory activities - Integrate active teaching/learning opportunities - Incorporate authentic components - Propose interest-based extension activities, and/or additional interdisciplinary connections, etc.

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	Disciplinary Concept: Digital Citizenship	
	<i>Core Ideas:</i>	Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.
	<i>Performance Expectation/s:</i>	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
	Career Readiness, Life Literacies, & Key Skills Practices	
	Act as a responsible and contributing community member and employee. Attend to financial well-being. Consider the environmental, social and economic impacts of decisions. Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them.	

Content Area: Mathematics (NJSLS-M)
ALGEBRA 1

Dev. Date:
2021

	Model integrity, ethical leadership and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration and communicate effectively. Work productively in teams while using cultural/global competence.
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New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
	Amistad Law: <i>N.J.S.A. 18A 52:16A-88</i>	x	Holocaust Law: <i>N.J.S.A. 18A:35-28</i>		LGBT and Disabilities Law: <i>N.J.S.A. 18A:35-4.35</i>	x	Diversity & Inclusion: <i>N.J.S.A. 18A:35-4.36a</i>		Standards in Action: <i>Climate Change</i>