Algebra II Curriculum Guide
Tier 1 & 2

Unit 2: Building New Function
December 1 – January 31

ORANGE PUBLIC SCHOOLS 2018 - 2019

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

Contents

Unit Overview

Unit 3: Rational Functions and Equations
Overview
This course uses Agile Mind as its primary resource, which can be accessed at the following URL: ➢ www.orange.agilemind.com Each unit consists of 1-3 topics. Within each topic, there are "Exploring" lessons with accompanying activity sheets, practice, and assessments. The curriculum guide provides an analysis of teach topic, detailing the standards, objectives, skills, and concepts to be covered. In addition, it will provide suggestions for pacing, sequence, and emphasis of the content provided.
Essential Questions
➢ How can you transform any given function on the coordinate plane? ➢ How do you identify odd and even function based on the symmetry? ➢ What is an inverse function? ➢ How are a function and its inverse function related? ➢ How do you find inverse function algebraically? ➢ What is rational function? ➢ What is the parent function of a rational function? ➢ What is inverse proportion? ➢ How can you model with a rational function? ➢ To simplify the nth root of an expression, what must be true about the expression? ➢ How do you solve systems of equations with three variables?
Enduring Understandings
➢ A rational function is a function formed by the quotient of two polynomials. ➢ Parent function of a rational function is 1/x ➢ Inverse proportion is when one value decreases at the same rate that the other increases. ➢ You can model a rational function with a table, equation, and graph. ➢ Corresponding to every power there is a root ➢ You can combine like radicals using properties of real numbers ➢ You can write a radical expression in an equivalent form using a fractional (rational) exponent instead of a radical sign ➢ Solving a square root equation may require that you square each side of the equation. This process can introduce extraneous solutions

Common Core State Standards ***(NJSLS/CCSS)***

1) A-APR D.6: Rewrite rational expressions 6. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

2) A.APR.D.7: (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

3) A-CED A.2: equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

4) F-IF A.1: Understand the concept of a function and use function notation 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). B. Interpret functions that arise in applications in terms of the context

5) F-IF B.4: Interpret functions that arise in applications in terms of the context. 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.~~

6) 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.

~~7)~~ F-IF.7b: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, ~~cube root, and piecewise-defined functions, including step functions and absolute value functions.~~

8) F-BF B.3 Build new functions from existing functions 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

9) A-CED. A.1: Create equations that describe numbers or relationships 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.

10) A-CED.A3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non- viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. Reasoning with Equations and Inequalities

11) A-REI A.2: Understand solving equations as a process of reasoning and explain the reasoning 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

12) A.RE.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

Major Content
Supporting Content
Additional Content
~~Parts of standard not contained in this unit~~
Algebra I Content

21st Century Career Ready Practice

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Algebra II Unit 3

Unit 2: Building New functions (30 Days)

Topics:

- Simplifying and solving simple rational functions
- Inverse function
- Transformation of the polynomial
- Even and Odd function
- Radical equation
- Solve Equations with more than two unknowns

Big Rock CCSS	Related Topic	Lesson Objective	Big Rock Tasks
13) F-BF.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. Include recognizing even and odd functions from their graphs and algebraic expressions for them. 14) F.BF.4: Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or f(x) = (x+1)/(x–1) for x≠1. c. (+)Read values of an inverse function from a graph or a table, given that the function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the domain.	Transformation/even and odd function	1.1a (F-BF.3) Students will be able to describe transformation for any polynomial represented algebraically or graphically 1.1Bv(F-BF.3) Given a graph or verbal description Students will • create the function in the format $f(x) + k$, and $f(x - h) + k$, and a$f(x - h) + k$. • And create a graph 1.2(F-BF.3) Students will • Identify if a polynomial is even or odd graphically and allgebraically	Tasks are in the Department drobox
		2.1 (F.BF.4) Students will • Understand graphical, tabular, and algebraic relationship between a linear function and its inverse with and without context and find inverse of the linear function	

A-REI A.2: Understand solving equations as a process of reasoning and explain the reasoning 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. F-BF.Int.2: Find inverse functions to solve contextual problems. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) = $2x^3$ or f(x) =x+1 / x−1 for x ≠1. A.RE.I.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. F-IF.7b: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square A-REI.6: Solve systems of equations 6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables	Big Rock1: Rational and Radical Function And inverse function	3.1a (A-REI A.2, F-BF.Int.2) • Students will know the definition of rational function and use the functions to explore the general behavior of the graphs and define the domain of the functions. • Given a simple rational equation Students will: ✓ Simplify the rational equation and identify the domain of the function (Numerators and denominators that have degree at most 2.) ✓ Solve simple rational equations and identify the extraneous solution (Numerators and denominators that have degree at most 2.) ✓ Find inverse of the rational Function 2.1 (A-REI A.2, A.RE.D.11, F-IF.7b) Using the definition of simple radical function and using the graphing calculator students will • Create a graphs of the radical function and identify domain of the function by looking at the pattern in the graphs • Solve simple radical equation graphically • Solve simple radical equations Algebraically and understand which step produces extraneous solution, and identify the extraneous solution	

	Solving systems of equations	3.1a (A.RE.D.11) Using a graphing calculator Students will • Solve systems of equations and interpret solution 3.1b (A-REI.6) Given a linear and quadratic equation students will • Solve systems of equations algebraically 3.1c (A-REI.6) Given three linear equations students will • Solve systems of equation algebraically	

Calendar

December 2018						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
						1
2	**3**	4	**5**	**6**	**7**	**8**
9	**10**	**11**	**12**	**13**	**14**	**15**
16	**17**	**18**	**19**	**20**	**21** **Half Day** **Christmas break starts**	**22**
23	**24** **Christmas Eve** **No School**	**25** **Christmas** **No School**	**26** **Christmas** **No School**	**27** **Christmas** **No School**	**28** **Christmas** **No School**	**29**
30	**31** **New Year's eve** **No School**					

January 2019						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 New year No School	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21 MLK No School	22	23	24	25	26
27	28	29	30 Half Day	31 Half Day		

Assessment Framework

Assessment	Assignment Type	Grading	Source	Estimated in-class time	When?
Diagnostic Assessment *Unit 3 Diagnostic*	Test	Traditional (zero weight)	Curriculum Dept. created – see Dropbox	< ½ block	Beginning of unit
NWEA - Winter	Screener	Graded online	N/A	1 block	End of December
MP 2 Benchmark	Test	Graded on Edulastic and some questions requires Rubric	Curriculum Dept. created – distributed at end of unit	1 block	End of Cycle 2
Performance Task *Unit 3 Performance Task1*	Authentic Assessment	Rubric	Topic constructed response (also see Dropbox)	½ block	In topic 8
Performance Task *Unit 3 Performance Task2*	Authentic Assessment	Rubric	Topic constructed response (also see Dropbox)	½ block	In topic 9
Teacher Created Test	Test				
Quizzes	Quiz	Rubric or Traditional	Teacher created or "Practice" in Agile Minds	< ½ block	Varies (must have 3 quizzes per MP)

Algebra II Unit 3

Scope and Sequence

Overview			
Agile Mind Topic	Name	Agile Mind "Blocks"*	Suggesting Pacing
2	**Inverse Function**	**1**	**2 days**
3 and some of 5	**Transformation and even/odd functions**	**3**	**5 Days with supplements**
8	**Rational Functions**	**3**	**2 to 3 days**
9	**Rational Equations**	**1**	**2 days with supplements**
10	**Square Root Function and Equation**	**n/a**	**2 days**

Diagnostic Assessment	**½ day**
Nwea	**1 day**
Teacher created Assessment	**2 days**
MP 2 Benchmark assessment	**1 day**
Performance Task 1	**½ day**
Performance Task 2	**½ day**
Review	**1 day**
Total	**11 days**

*1 Agile Mind Block = 45 minutes

Topic 2: Understanding Inverse Relations

Topic Objectives (Note: these are not in 3-part or SMART objective format)

1. Understand graphical, tabular, and algebraic relationship between a linear function and its inverse.
2. Understand the relationship between exponential and logarithmic functions
3.
4. Understand the relationship between quadratic and square root functions
5. Identify one-to-one functions
6. Be able to restrict the domain of a quadratic function in order for its inverse to be a function

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP3: Model with mathematics
- MP 5: Use appropriate tools strategically
- MP 6: Attend to precision
- MP7: Look for and make sense of structure

Vocabulary

- Relation, Inverse function, Quadratic function, Parabola, One to one function, exponential function logarithmic function, discriminant,

Fluency

- Definition of functions and relations
- Determine rate of change from graphs, tables and function rule
- Identify domain and range of a function from graphs and tables
- Determine distance from one point to another point in a Cartesian plane
- Understand different forms of linear and quadratic functions

NOTE: Skip Exploration " Defining parabolas"

Suggested Topic Structure and Pacing

Block	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
1	1	*Block 1* *Block 2*	2, 3,8	Cover the guided practice questions aligned to this block
2	2	*Block 3*	2, 3, 5,6	This block is kept the same as agile mind so that guided practice can be covered. This topic is not intended to cover square root functions fully but intended to focus on developing the concept of inverse function and identifying parent function
3	3,4, 5	*Block 4, 5,*	2, 5, 6, 7	This topic is not intended to cover exponential and logarithmic function fully but intended to focus on developing the concept of inverse function and identifying parent function

4		*Block 6,*		Use this block for extra practice and assessment

CCSS	**Concepts** What students will know	**Skills** What students will be able to do	Material/Resource
F.IF.1: *Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of is the graph of the equation y = f(x)* F.IF.2: *Use function notation. Evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.* F.IF.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.BF.4: Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write anexpression for the inverse. For example, f(x) =$2x^3$ or f(x) = (x+1)/(x–1) for x≠1. c.(+)Read values of an inverse function from a graph or a table, given that the	***Block 1 Review:*** • Domain and range of a function, • rate of change from graph, table and function rule • Understand dependent and independent variables • understand quadratic function, linear function • process of solving equation ***Block 1 New*** • Concept of relation and inverse from a table and graph • Inverse relation of a linear equation using a table and graph • The graph of inverse function is reflection of the graph of the original function across line y=x	***Review Block 1*** • Identify domain and range of a function from graph • Determine rate of change from graph, table and an equation • Write linear equation from a table and graph using slope intercept form and point slope form • Determine independent and dependent variables form a table and graph • Identify a quadratic function and linear function • Solving two step linear equation with rational coefficients • Solving literal equation ***Block 1 New*** • Find inverse relation of a linear equation using table and equation • Graphing inverse relation • Write inverse function rule	Agile Mind Topic 2: *** Overview** ***Exploring** **"The inverse of a linear function**: SAS 2: Q 3-7 SAS 2: 17, 18, 19a-c, 20, 21
	Block 2 Review: Exponential equations, Law of exponent, vertical line test ***Block 2 New:*** • Concept of Fractal • logarithmic function • Horizontal line test (one-to-one relation) • Inverse of an exponential function as the logarithmic function • Y = b^x is not one to one function when b = 1 • $f^{-}(x)$ notation to denote $y = log_b x$ • Domain and range of inverse function of exponential function	***Block 2 Review*** • Writing exponential equations, • Applying Law of exponent (Power rule) • Apply vertical line test to determine if the function is a relation ***Block 2 New:*** • Performing Horizontal line test to determine if the inverse function of a given function is a function • Writing inverse of an exponential function using the logarithmic notation • Understanding that Y = b^x is not one to one function when b = 1	Agile Mind Topic 2: ***Exploring :"** **The exponential function and its inverse"**

function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the domain.		• Use $f^{-}(x)$ to denote inverse of a function • Interpreting domain and range of an inverse exponential function from graph	
	Block 3 Review: • Various form of quadratic function • Domain and range of a quadratic function • Square root • Horizontal line test on original function ***Block 3 New:*** • Inverse function of quadratic function	***Block 2 Review:*** • Identifying domain and range of inverse of a quadratic function from graphs • ***Block 3 New*** • Writing inverse of a quadratic function using table and equation • Graphing with restricted domain for the inverse of quadratic to be a function (similar to piecewise function)	**Agile Mind Topic 2:** *Exploring: "The quadratic function and its inverse" SAS 4: Q9-11 Q16a-c and Q17
	Block 4 Review: Guided Practice, Constructed Response	***Block 4 Review:*** Guided Practice, Constructed Response	**Topic 2** ***Guide Practice** ***Constructed Response** (one-to-one computer needed) More Practice P5-8

Topic 3: Transforming functions

Topic Objectives (Note: these are not in 3-part or SMART objective format)

1. Apply transformations to graphs of parent functions
2. Recognize the general form of a quadratic equations and explains how the values of a, h, and k affects the shape of the parabola
3. Describe the transformations from one function to another in terms of vertical shifts, vertical shrink, stretches, and horizontal shifts
4. Relate geometric transformations to tables of values for functions
5. Identify odd and even functions from equations and graphs

Focused Mathematical Practices

6. MP 2: Reason abstractly and quantitatively
7. MP 4: Model with mathematics
8. MP 5: Use appropriate tools strategically
9. MP 6: Attend to precision
10. MP 7: Look for and make use of structure

Vocabulary

Transformations of functions, parent function, vertical shift, horizontal shift, vertical stretch, vertical shrink, vertical compressions, quadratic function, Even function, Odd function

Fluency

11. The general shape of the graph of a quadratic function
12. Plotting points
13. Reflecting functions, vertical stretches and shrinks, and vertical shifts of quadratic functions

Suggested Topic Structure and Pacing

Block	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
1	1 - 2	*Block 1* *Block 2*	2,4	
2	2 - 3	*Block 3* *Block 4*	2, 4, 5,7	Provide computers for students to explore the effect of a, h, and k in a quadratic function (at least 1 computer for each group)
3	4	*Block 5*	4, 5 7	
4	1-4	*Block 6 and 7*		Have students correct the problems they got incorrect on the Guided practice, showing all work.

CCSS	**Concepts** What students will know	**Skills** **What students will be able to do**	**Material/Resource**
1) F.BF.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. ~~Include recognizing even and odd functions from their graphs and algebraic expressions for them.~~	***Block 1 Review:*** • Parent function of linear and quadratic functions • expressions with negative exponents • Translation, Reflection ***Block 1 New*** • Family of parent functions • Absolute value function • Transformation to fit the data	***Block 1 Review*** • Evaluate expressions with negative exponents • Translating linear and quadratic functions vertically and horizontally ***Block 1 New*** • Define Parent function and transformation • Identify Family of parent functions • Identify Absolute value function	Agile Mind Topic 3: ***Overview** ***Exploring** "Transformations to fit data" P1-7 SAS 1: Q4a-c Q9z-b Q1-a-b More practice P 1-3
	Block 2 Review: • Vertex form of the quadratic equation $Y= A(x-h)^2 + k$ • simple quadratic equation $y= (x^2 + k)$ ***Block 2 New:*** • Effect of a, h, and k • Piecewise function	***Block 2 Review:*** • Identify Vertex form of the quadratic equation $A(x-h)^2 + k$ Describe Effect of K on simple quadratic equation $y= x^2 + k$ ***Block 2 New:*** • Describe the Effect of stretch factor, horizontal shift and Vertical shift • Transform Piecewise function	Agile Mind **Topic 3:** ***Exploring** "Transformations to fit data" **P 8-13** ***Exploring** "Generalizing transformation" SAS 2: Q16 Q18a-c SAS 3: Q8, 9 & Q10a-b ** Computers for at least 1 for each group
	Block 3 Review: • Evaluating algebraic expressions ***Block 3 New:*** • Algebra and geometry connection	***Block 3 Review:*** • Evaluating algebraic expressions with negative integers ***Block 3 New:*** • Making Algebra and geometry connection to determine the effect of horizontal shift • Decide algebraic rules for function transformation	Agile Mind Topic 3: ***Exploring:** "Making the algebra-geometry connection" ***Summary** SAS 4: Q6-9

	Block 4 Review • Rotation, Reflection ***Block 4 New*** • Definition of even and odd functions • Definition of Line symmetry Point symmetry	• Rotating shapes on a coordinate plane • Reflecting lines over line ***New*** • Sketching graphs given intervals where the function is concave up or down and given the point of inflection • Determining whether a function is even or odd graphically • Determining whether a function is odd or even algebraically	**Day 4 (Material)** Agile Mind Topic 4 *** Exploring** "Quadratic and Cubic" **P10 - 11** SAS 3 Q15a – c GP 7 – 10 MP pg. only 11 Department provide supplements for identifying even and odd functions algebraically, graphically
	Block 5 : Guided Practice, Constructed Response		Agile Mind: ***Guided Practice** ***Constructed response** Moe practice: P 4-11 ** Computer provided for each student

Topic 8: Rational functions

Topic Objectives (Note: these are not in 3-part or SMART objective format)

1. Define rational function and create rational functions.
2. Interpret models of rational functions.
3. Demonstrate transformation of functions on rational functions using parameter changes.

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP4: Model with mathematics
- MP 5: Use appropriate tools strategically
- MP 6: Attend to precision
- MP7: Look for and make sense of structure

Vocabulary
Rational functions, Parent function, Domain, Range.

Fluency

- Computing with percent
- Rates and Ratios
- Writing linear functions with one variables
- Domain and Range

Suggested Topic Structure and Pacing

day	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
Day 1	1 & 2	*Block 1 & 2*	2,4,7	Overview: "Rational Function" Pages 1 - 4 Explore: "Modeling with rational functions" page 1 – 5 Department will provide supplements
Day 2	1 & 2 & 3	*Block 3 & 4*	2, 4, 7	Explore: "Modeling with rational functions" pages 6 – 12

CCSS	**Concepts** What students will know	**Skills** What students will be able to do	Material/Resource
~~1)~~ 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.*~~ 2) F-BF B.3 Build new functions from existing functions 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	***Day 1*** ***Review*** • Definition of rates ratio, Definition of linear parent function ***New*** • Definition of Rational function • Definition of vertical asymptote	***Day 1*** ***Review*** • Writing rates and ratios ***New*** • Create rational function • Transform rational functions • Identify vertical asymptote	***Day 1*** Agile Mind Topic 8 *** Overview** **P 1 - 4** *** Exploring** "Modeling with rational function" **P 1 – 5** Suggested assignment: SAS 1 Q7 a – b and 8a – c Guided Practice page 1-5
1) F-BF B.3 Build new functions from existing functions 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. Include recognizing even and odd functions from their graphs and algebraic expressions for 2) A-CED.2: Create equations in two or more variables to represent relationships between quantities; graph	***Day 2 (concept)*** ***Review*** • Concept of mixtures • Concept of part to whole • Definition of domain & range ***New*** • Rational function • Definition of the parent rational function	***Day 2 (skills)Review*** • Writing ratios with part to whole • Transformation with any function ***New*** • Writing ration function for a mixture	***Day 2 (Material)*** Agile Mind Topic 8 *** Exploring** ***Modeling with rational functions"** **P 6– 12** More Practice page 1-2 Suggested assignment: SAS 2 Q8 and 9a – c

equations on coordinate axes with labels and scales.			

Topic 9: Rational Equation

Topic Objectives (Note: these are not in 3-part or SMART objective format)

1. write rational equations to model problem situation
2. Solve rational equations using graphs, tables, and analytic strategies
3. Identify extraneous solutions.

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP4: Model with mathematics
- MP7: Look for and make sense of structure

Vocabulary: Rational Equations, Extraneous solutions

Fluency

- Solving proportion
- Solving linear equations with variables on both sides of the equal sign
- Creating linear equations with one variable
- Computing rates in terms of distance and time

Suggested Topic Structure and Pacing

Day	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
1	1, 2	*Block 2*	2, 4, 7	Exploring "Solution Methods" Pages 6 – 11

CCSS	Concepts What students will know	Skills What students will be able to do	Material/Resource
1) A-REI A.2: Understand solving equations as a process of reasoning and explain the reasoning 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. 2) 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.	***Day1 (Concept)*** ***Review:*** • Definition of rates • Definition of proportion ***New*** • Definition of rational equations • Definition of extraneous solution	***Day 1 (Skills)*** ***Review*** • Computing rates using distance and time • Solving equations with variables on both ides • Writing proportions • Solving proportions ***New*** • Creating rational equations • Solving rational equations	**Day 1 (Material)** Agile Mind Topic 9 *** Exploring** "Rational Equations " P 6-11 SAS 2 Suggested assignment: SAS 2 Q19a-c More Practice 1

Topic 10: Square root functions and Equation

Topic Objectives (Note: these are not in 3-part or SMART objective format)

After completing the topic square root functions and equations, students will be able to .

1. Determine the reasonable domain and range values of square root functions when given in context, as well as interpret and determine the reasonableness of solutions to square root equations.
2. Analyze situations modeled by square root functions
3. Formulate equations, select a method and solve problems
4. Relate representations of square root functions, such as algebraic, tabular, graphical and verbal descriptions
5. Solve square root equations

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP 4: Model with mathematics
- MP 5: Use appropriate tools strategically
- MP 6: Attend to precision
- MP 7: Look for and make use of structure

Vocabulary

Quadratic formula, Imaginary numbers, complex numbers, discriminant, real roots and complex roots

Fluency

- Order of Operations
- Creating and analyzing graphs and tables
- Domain and range
- Transformation of functions
- Inverting a functional relationship
- Simplifying radical expressions

Suggested Topic Structure and Pacing

Day	Objective(s) covered	Agile Mind "Blocks" (see Professional Spport for further lesson details)	MP	Additional Notes
1	all	*Block 1*	2,4,5	Supplement in dropbox(see in the 16-17 Tier 1 Unit 3)

CCSS	**Concepts** What students will know	**Skills** What students will be able to do	Material/Resource
1) F-BF B.3 Build new functions from existing functions 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them. 2) A-REI A.2: Understand solving equations as a process of reasoning and explain the reasoning 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. 3) A.RE.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	***Day1 (Concept)*** ***Review*** • Definition of parent functions • Effect on the graph of f(x+k), f(x)+k, kf(x), f(kx) for the parent function f(x) • Domain and Range ***New*** • Definition of square root function • Transforming the square root functions requires the same concept as any other parent functions • Domain and range is of the Square root parent function	***Day 1 (Skills)*** ***Review*** • Identifying parent linear, quadratic, exponential and logarithmic function • Determine domain and range of any function ***New*** • Graphing square root function • Identifying square root function • Applying transformation to find roots of the polynomials • Transform Square root function • Identify Domain and Range of Transformed Square root function • Solve square root equations	**Day 1 (Material)** Dropbox Tier 1 Unit 3

Ideal Math Block

The following outline is the department approved ideal math block for grades 9-12.

1) Do Now (7-10 min)
    a. Serves as review from last class' or of prerequisite material
    b. Provides multiple entry points so that it is accessible by all students and quickly scaffolds up

2) Starter/Task (10 to 15 min)
    a. Designed to introduce the lesson
    b. Uses concrete or pictorial examples
    c. Attempts to bridge the gap between grade level deficits and rigorous, on grade level content
    d. Provides multiple entry points so that it is accessible by all students and quickly scaffolds up

3) Mini-Lesson (15-20 min)
    a. Design varies based on content
    b. May include an investigative approach, direct instruction approach, whole class discussion led approach, etc.
    c. Includes CFU's
    d. Anticipates misconceptions and addresses common mistakes

4) Class Activity (25-30 min)
    a. Design varies based on content
    b. May include partner work, group work/project, experiments, investigations, game based activities, etc.

5) Independent Practice (7-10 min)
    a. Provides students an opportunity to work/think independently

6) Closure (5-10 min)
    a. Connects lesson/activities to big ideas
    b. Allows students to reflect and summarize what they have learned
    c. May occur after the activity or independent practice depending on the content and objective

7) DOL (5 min)
    a. Exit slip

MTSS MODEL

Whole Group Instruction	50 min	INSTRUCTION (Grades 9 – 12) Daily Routine: Mathematical Content or Language Routine Anchor Task: Anticipate, Monitor, Select, Sequence, Connect Collaborative Work* Guided Practice Independent Work (Demonstration of Student Thinking)		TOOLS Manipulatives RESOURCES Agile Mind
Rotation Stations (Student Notebooks & Chromebooks Needed)	1-2X 25 min	STATION 1: Focus on current Grade Level Content STUDENT EXPLORATION* Independent or groups of 2-3 Emphasis on MP's 3, 6 (Reasoning and Precision) And MP's 1 & 4 (Problem Solving and Application) TOOLS/RESOURCES Agile Mind Math Journals	STATION 2: Focus on Student Needs TECH STATION Independent TOOLS/ RESOURCES Khan Academy Approved Digital Provider Fluency Practice	TEACHER STATION: Focus on Grade Level Content; heavily scaffolded to connect deficiencies TARGETED INSTRUCTION 4 – 5 Students TOOLS/ RESOURCES Agile Homework Manipulatives
	5 min	INSTRUCTION Exit Ticket (Demonstration of Student Thinking) TOOLS/RESOURCES Notebooks or Exit Ticket Slips		

Sample Lesson Plan (Agile Mind)

Lesson	Topic 8 Rational Functions Exploring "Modeling with Rational Functions"	**Days**	1
Objective	By using the concept of a quiz grade SWBAT • Define rational function and create rational functions. • Interpret models of rational functions.	**CCSS**	A.CED.A1
Learning activities/strategies	**Materials needed:** Computer with projection device, transparency to insert the activity sheets, and activity sheets **Fluency Practice:** (5 minutes) A builder could get 6 sheets of sheetrock for $9. If he bought 12 sheets, how much money would he have spent? **Do Now (5 minutes):** If you scored 16/25, 20/25, 10/25, and 18/25 on 4 different quizzes in your math class, What must you score on the 5th quiz in order to achieve an average grade of 80% **Starter/Launch (3 minutes):** • Students will work on the distance verses time table on the student activity sheet problem 1. After they complete the table ask students the following questions • What kind function is this? • What is the appropriate domain for this context? Discuss the characteristics about the graph to prevent it from being exponential or logarithmic. Introduce today's objective. **Mini lesson and practice (20 minutes):** **Note: Every bullets need to be timed.** • Display page 1 from "Overview" and ask students how can they write 3/20 as percent (Two different way) • Show page 2 and give students time to find the grade after the second quiz. [SAS 1, question 2] Play panel 1 as needed to check student work. • Advance to panel 2 of the animation and give students time to make sense of the table shown there. Be sure students understand that the two additional numbers in the first column of the table reflect the cumulative points earned after the third and fourth quizzes respectively. Students can then complete SAS 1 question 3a [SAS 1, question 3a] • If needed, play panel 2 to allow students to check their entries. Then, give students time to write a function that models the data in the table, as prompted in the final caption. [SAS 1, question 3b] Use these questions if students appear to be struggling: ➢ What was staying constant or same in the process column? ➢ What was varying or changing? • Use panel 3 as needed to confirm students' function rules. Ask student: ➢ What does the final grade depends on? • Ask students to graph the function and determine the number of additional points needed for a grade of 90% [SAS 1, question 4]. To confirm their answer show students Page 3 and ask a student to come up to the smart board to move the slider (animation) to verify their answer • Show page 4 to define rational function. Have students complete student activity sheet 1 questions 5 and 6		

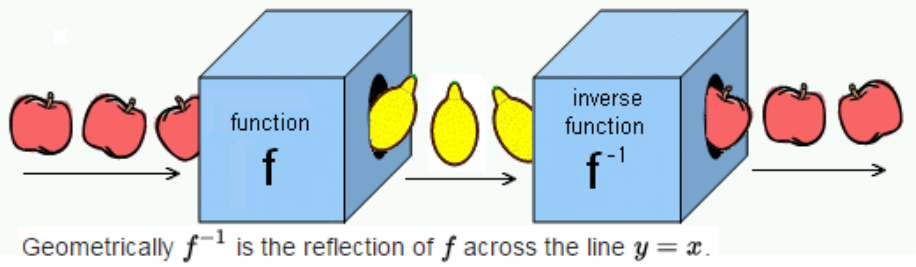
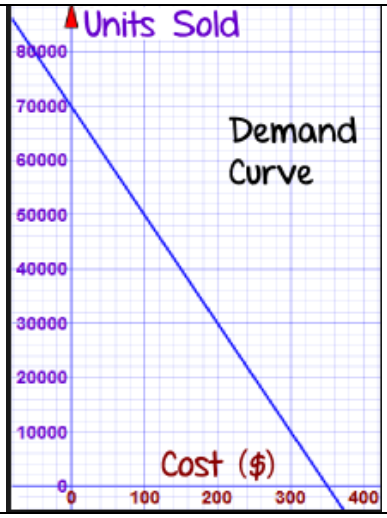
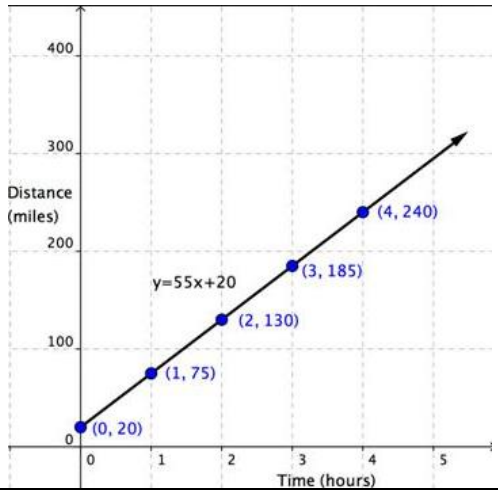
	Have students do a Read Pair Share of the text on page 4. (Read by themselves, then pair up with someone and share what they read and if there is anything they didn't understand) Ask students based on the example if they can give some examples of rational functions • Have students discuss the similarities and differences between Terrence's graph and the graph on page 4. Encourage them to describe any transformations of the parent function they see in Terrence's graph. **Group work/ Partner work (25 minutes)** Show students page 1. Students can individually read the paragraph about building brick wall then pair up with a partner and complete the questions 1 – 6 from the SAS 2 Debrief question 4, 5, and 6 as a class for 5 minutes **Independent Practice (12 minutes):** • Re-inforce SAS 2 Question 9 • Debrief and check for 2 minutes **Closure (2 minutes):** • Ask what is a rational function? How can you model a rational function? What is the parent rational function? What is domain and range of a rational function? And what are some example of rational functions in real life. **DOL (5 minutes):**

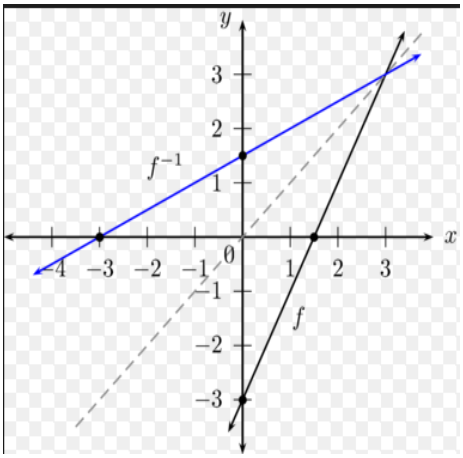
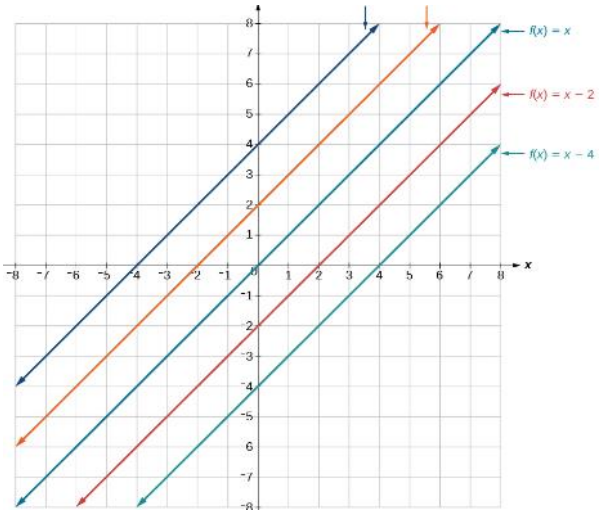
Supplement Materials

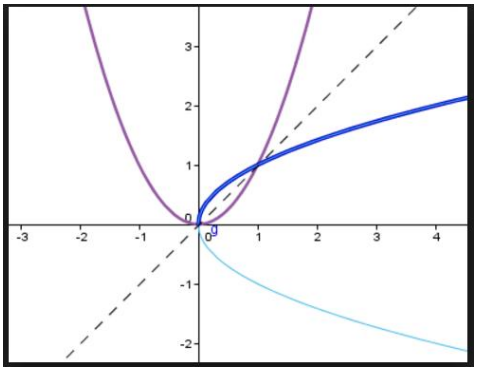
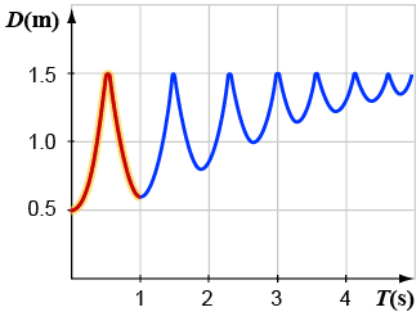
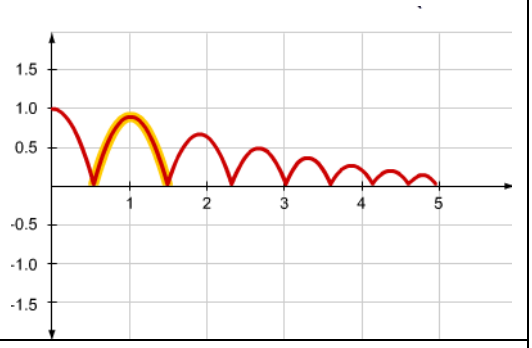
Tasks			
CCSS	SMP	Dropbox location and filename	Link (original task and answer key)
		9-12 Dropbox> curriculum algebra 2>Tier1/2 > Unit 1 > Performance Assessment> Task1	

ELL/SWD supplement link

http://nlvm.usu.edu/en/nav/vlibrary.html
http://www.explorelearning.com/index.cfm?method=cResource.dspBrowseCorrelations&v=s&id=USA-000
http://www.thinkingblocks.com/

		Multiple Representations
Linear function	Real Life Image	 An airplane flies at a constant Altitude (height vs. time)  Patterns in nature can be described by arithmetic sequence. The picture above Shows Height of the plants Vs. Time.  Geometrically f^{-1} is the reflection of f across the line $y = x$. Conceptually, using the *box* analogy, a function's inverse box *undoes* what the function's regular box does.
	Pictorial (Coordinate Plane)	 

		Linear functions Linear discrete function  Linear inverse function  Transforming linear function y = x by shifting the y intercept or k

	Pictorial (Coordinate Plane)	Quadratic function and it's inverse  Range is [0, ∞) for the inverse to be one to one Transforming quadratic function to fit the data  
	Rules/Function	**Quadratic function** $f(x) = x^2$ Standard form: $f(x) = ax^2 + bx + c$ Factored form: $a(x - x_1)(x - x_2)$ Vertex form: $a(x - h)^2 + k$ vertex(h,k) **Transformation of quadratic function** $-a(x - h)^2 \pm k$ Vertically shift k units up (+) or down (-) Horizontally shift h units right if h is "+" Horizontally shift h units to the left if h is "-" Reflect over x axis if a is " –" Vertically stretches if a>0 Vertically shrinks if a<0 **Inverse function** $y = x^2$ $x = y^2$ switch x and y $\sqrt{x}$ = y take square root on both sides Domain: x>0

<table>
<tr><th colspan="2">Rational function</th></tr>
<tr><td>Verbal description</td><td>A rational function is a function formed by the quotient of two polynomials.</td></tr>
<tr><td>Function form</td><td>$f(x)=\frac{a(x)}{b(x)}$ where a(x) and b(x) are polynomial functions</td></tr>
<tr><td>Parent function (Graph)</td><td> 

$f(x)=\frac{1}{x}$</td></tr>
<tr><td>Parent function (Table)</td><td>
<table>
<tr><th>x</th><th>y</th></tr>
<tr><td>-3</td><td>$-\frac{1}{3}$</td></tr>
<tr><td>-2</td><td>$-\frac{1}{2}$</td></tr>
<tr><td>-1</td><td>-1</td></tr>
<tr><td>0</td><td>undefined</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>2</td><td>$\frac{1}{2}$</td></tr>
<tr><td>3</td><td>$\frac{1}{3}$</td></tr>
</table>
</td></tr>
<tr><td>Function Characteristics</td><td>Domain: {x| x<0} U {x| x>0}
Range: {f(x)| f(x) < 0} U {f(x)| f(x) > 0}
Zeros: none
x-intercept & y-intercept: none
Decreasing: {x| -∞ < x < 0} U {x| 0 < x < ∞}
End Behavior: As x approaches - ∞, f(x) approaches 0; as x approaches + ∞, f(x) approaches 0.
Asymptotes: x = 0, y = 0</td></tr>
<tr><td></td><td></td></tr>
</table>

	Rational equation
Verbal description	Equation that contains rational expressions
Equation	$\frac{Distance}{Rate} + \frac{Distance}{Rate} = Time$
Extraneous solution	Extraneous solution is a solution of an equation derived from an original equation that is not a solution of the original equation. When you solve a rational equation or square root equation, it is possible to get extraneous solutions. These values must be eliminated from the solution set. Always check solutions by substituting them into the original equation
Real life example	Jill takes 2 hours to plant 500 flower bulbs. Jack takes 3 hours to plant 450 flower bulbs. Working together, how long should it take them to plant 1500 bulbs $r = \frac{work}{time} = \frac{1500}{time}$ $\frac{500\ flowers}{2\ hr.} + \frac{450\ flowers}{3\ hr.} = \frac{1500}{t}$ $\frac{2400}{6} = \frac{1500}{t}$ t = 3.75 hr.

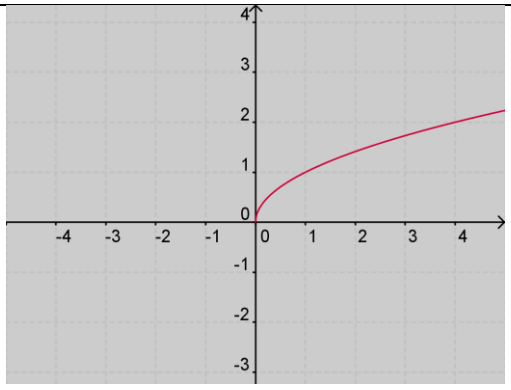
Square root function and Equation	
Parent function	$f(x) = \sqrt{x}$
Transformed function	$f(x) = a\sqrt{x-h} + k$
Graph of the parent function	

Table of the parent function

x	y
0	0
1	1
2	$\sqrt{2}$
3	$\sqrt{3}$
4	2
5	$\sqrt{5}$

Characteristics

Domain: $\{x|\ x \geq 0\}$

Range: $\{f(x)|\ f(x) \geq 0\}$

Zeros: x=0

x-intercept: (0, 0) **y-intercept:** (0, 0)

Increasing/Decreasing: Increasing on $\{x|\ 0 < x < \infty\}$

End Behavior:

As x approaches + ∞, f(x) approaches + ∞.

Real World Application

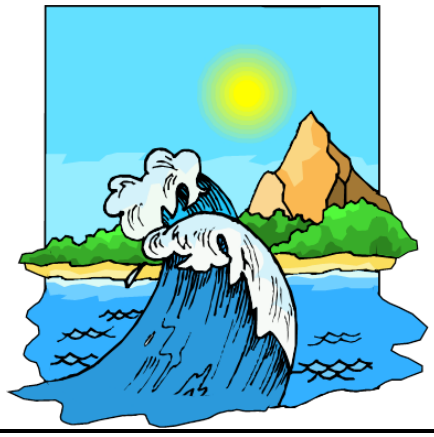
The speed of a tsunami is a function of ocean depth:

SPEED = $\sqrt{d \cdot g}$

***g* = acceleration due to gravity (9.81 m/s^2)**

***d* = depth of the ocean in meters**

Understanding the speed of tsunamis is useful in issuing warnings to coastal regions. Knowing the speed can help predict when the tsunami will arrive at a particular location.



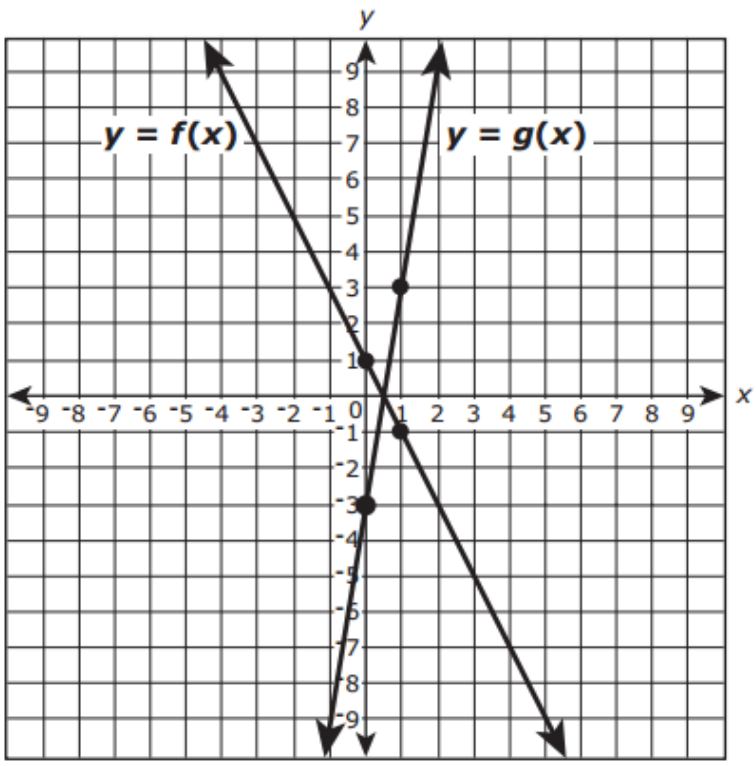
PARCC Sample Item

CCSS: F.BF.3

Identify the effect on the graph of replacing *f(x)* ***by*** *f(x)+k, kf(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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.***

Review from unit assessment:

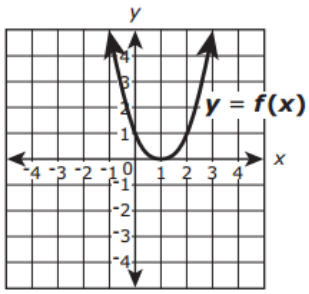
The figure shows the graphs of the functions $y = f(x)$ and $y = g(x)$. The four indicated points all have integer coordinates.



If $g(x) = k \cdot f(x)$, what is the value of k?

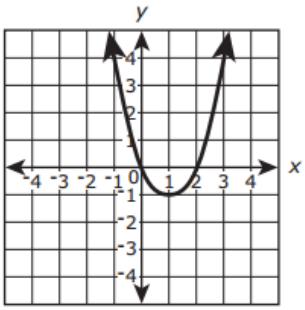
Task 1:

Consider the function $f(x)$, shown in the xy-coordinate plane, as the parent function.



Part A

The graph of a transformation of the function $f(x)$ is shown.

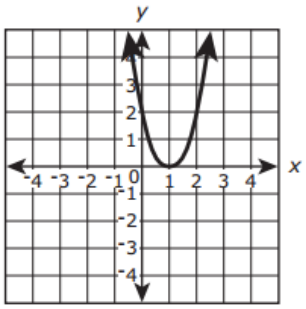


Which expression defines the transformation shown?

A. f(x+0)- 1 B. f(x+0) + 1 C. f(x -1) + 0 D. f(x+1) + 0

Part B

The graph of a transformation of the function $f(x)$ is shown.

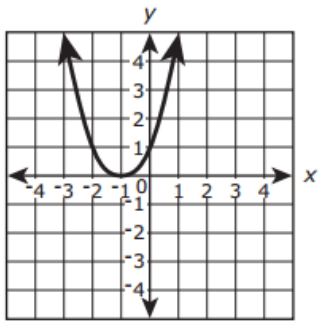


Which expression defines the transformation shown?

A. $\frac{1}{2}$f(x + 0) + 0 B. 2f(x+0) + 0 C. $\frac{1}{2}$f(x -1) – 1 D. 2f(x +1) - 0

Part C

The graph of a transformation of the function $f(x)$ is shown.



Which expression defines the transformation shown?

Ⓐ $f(x) - 2$

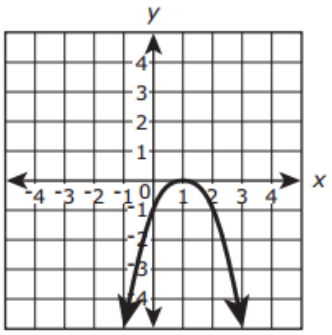
Ⓑ $f(x - 2) + 0$

Ⓒ $f(x) + 2$

Ⓓ $f(x + 2) + 0$

Part D

The graph of a transformation of the function $f(x)$ is shown.



The transformation shown can be expressed in the form $y = p[f(x + r)] + n$, where p, r, and n are constants. Which value must be less than 0?

Ⓐ p

Ⓑ r

Ⓒ x

Ⓓ n

Task 2:

The function f is defined by $f(x) = x^2 - 2x - 24$.

What are the zero(s) of $f(x + 3)$?

Select **all** that apply.

Ⓐ $x = -7$

Ⓑ $x = -4$

Ⓒ $x = -2$

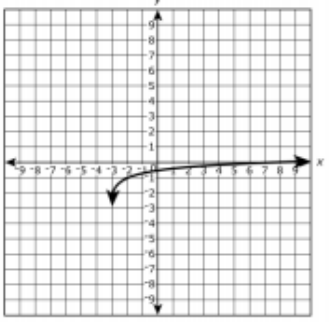
Ⓓ $x = 0$

Ⓔ $x = 3$

Ⓕ $x = 6$

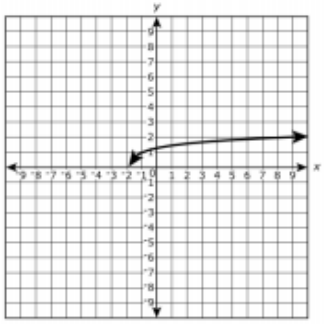
Task 3:

The given graph represents the function f(x). Let g be defined as g(x) = f(x-1) +2

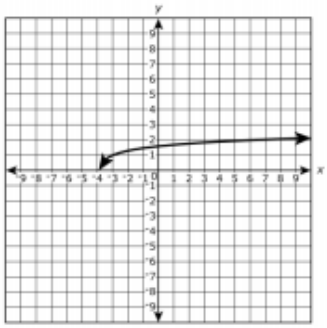


Which is the graph of g(x)?

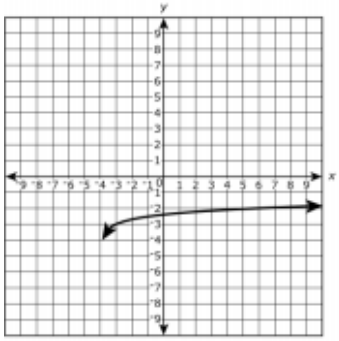
A.



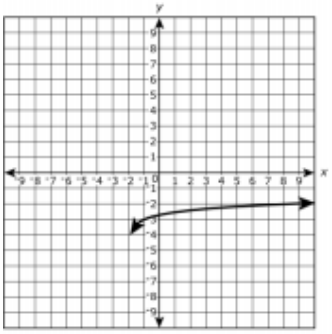
B.



C.



D.



Task 4:

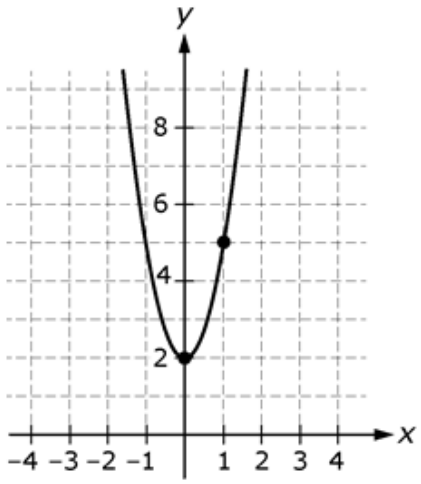
The graph of the function $h(x)$ is obtained from the graph of $f(x)$ by shrinking the graph of $f(x)$ vertically by a factor of 5 and reflecting the result over the y-axis. Which of the following equations gives $h(x)$ in terms of $f(x)$?

a. $h(x) = 5f(-x)$

b. $h(x) = \frac{1}{5}f(-x)$

c. $h(x) = -5f(x)$

d. $h(x) = -\frac{1}{5}f(x)$



The graph of the function g is shown in the coordinate plane above. If $f(x) = x^2$, and $g(x) = k\,f(x) + c$, what are the values of k and c ?

a. $k = \frac{1}{3}, c = 2$

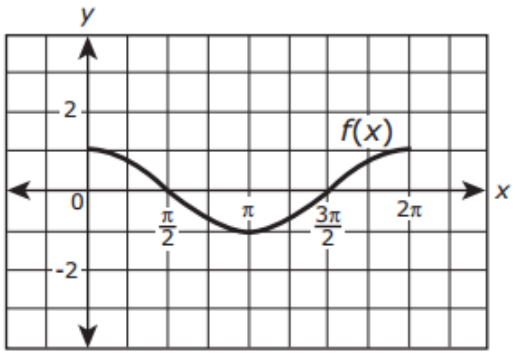
b. $k = \frac{1}{3}, c = -2$

c. $k = 3, c = 2$

d. $k = 3, c = -2$

Task 6

The graph shows $f(x) = \cos(x)$ on the interval $0 \leq x \leq 2\pi$.



Function h is a transformation of f such that $h(x) = -f(x)$. Which of the following statements is true?

Select **each** correct statement.

Ⓐ Function f is an even function.

Ⓑ Function f is an odd function.

Ⓒ Function f is neither an even nor odd function.

Ⓓ Function h is an even function.

Ⓔ Function h is an odd function.

Ⓕ Function h is neither an even nor odd function.

Task 7

Part A

Write an expression that defines $f(x + 5)$.

Enter your expression in the space provided.

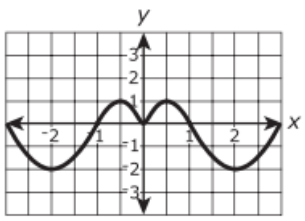
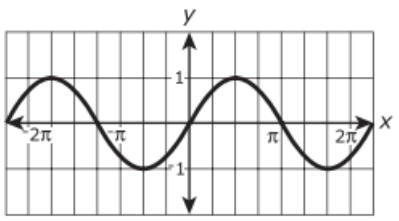
Part B

Describe the transformation that maps the graph of $f(x)$ to $f(x + 5)$. Justify your answer algebraically or by using key features of the graphs.

Enter your answer in the space provided.

Task 8

Consider the functions $f(x)$ and $g(x)$ described by the equations and the functions $h(x)$ and $k(x)$ shown by graphs.

$f(x) = 3x^2$	$g(x) = -x^3 + 5$		
		***h* (x)**	***k* (x)**

Which of the statements are true? Select **all** that apply.

Ⓐ f is an odd function.

Ⓑ f is neither an even nor odd function.

Ⓒ g is an even function.

Ⓓ g is neither an even nor odd function.

Ⓔ h is an even function.

Ⓕ h is an odd function.

Ⓖ k is an odd function.

Ⓗ k is neither an even nor odd function.

CCSS: A. REI.2

Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Practice

Task 1

The table shows the steps and explanations that can be used to solve $\sqrt{x} - 5x = -4$.

	Work	Explanation
	$\sqrt{x} - 5x = -4$	Given
Step 1	$\sqrt{x} = 5x - 4$	Addition property of equality
Step 2	$x = 25x^2 - 40x + 16$	Square both sides of the equation
Step 3	$0 = 25x^2 - 41x + 16$	Subtraction property of equality
Step 4	$0 = (25x - 16)(x - 1)$	Factor
Step 5	$(25x - 16) = 0$ or $(x - 1) = 0$	Zero product property
Step 6	$25x = 16$ or $x = 1$	Addition property of equality
Step 7	$x = \frac{16}{25}$ or $x = 1$	Division property of equality

Which step in the table could have created an extraneous solution?

A. Step 1

B. Step 2

C. Step 4

D. Step 5

Task 2:

Solve $\sqrt{a} = a - 6$. What is the extraneous solution?

Task 3

What extraneous solution arises when the equation $\sqrt{x+3} = 2x$ is solved for x by first squaring both sides of the equation?

Task 4

What is the solution to the equation $-\sqrt{x+10} = -7$?

Task 5

Solve the equation below. Explain your reasoning for each step.

$$\sqrt[3]{2x} - 22 = -18$$

\

Task 6

Solve the equation below. Show your work.

$$\sqrt{7x+15} = x+1$$

PARCC Preparation Material -- Solve system of equations

CCSS: A.AREI. 6,

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (it may contain 3 variables (Solve algebraically a system of three linear equations in three unknowns)

A.APR.7

Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y=-3x$ **and the circle** $x^2+y^2=3$**.**

A.APR.11

Explain why the x**-coordinates of the points where the graphs of the equations** $y=f(x)$ **and** $y=g(x)$ **intersect are the solutions of the equation** $f(x)=g(x)$**; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where** $f(x)$ **and/or** $g(x)$ **are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.**

PART I

Mini Lesson (Review how to use graphing calculator to solve system..)

Example 1: (calculator allowed question)

f(x) = $x^2 - 2x - 8$ **and g(x) =** $\frac{1}{4}x - 1$ **What is/are the value(s) of x when g(x) = f(x)**

Example 2: (calculator allowed question)

f(x) = $|x - 3|$ **and g(x) =** $9 - x$ **What are coordinates of the point(s) on the graph when g(x)=f(x)**

Practice:

Task 1: (Calculator allowed)

Given the functions $h(x) = |x - 4| + 1$ and $k(x) = x^2 + 3$, which intervals contain a value of x for which $h(x) = k(x)$?

Select **all** that apply.

Ⓐ $-4.5 < x < -3$

Ⓑ $-3 < x < -1.5$

Ⓒ $-1.5 < x < 1.5$

Ⓓ $1.5 < x < 3$

Ⓔ $3 < x < 4.5$

Task 2 (Calculator allowed)

$$\begin{cases} y = 1 - x^2 \\ y = 2 - x \end{cases}$$

How many points of intersection does the given system of equations have?

Ⓐ none

Ⓑ one

Ⓒ two

Ⓓ infinitely many

Task 3 (Calculator allowed)

Functions f and g are defined below.

$$\begin{cases} f(x) = \frac{1}{2x} \\ g(x) = x^2 \end{cases}$$

The graphs of $y = f(x)$ and $y = g(x)$ intersect at point P.

Determine the x-coordinate of P. Round your answer to the nearest tenth.

Task 4 (Calculator allowed)

Let $f(x) = ax^2$ where $a > 0$, and let $g(x) = mx + b$ where $m > 0$ and $b < 0$.

The equation $f(x) = g(x)$ has n distinct real solution(s). What are **all** the possible values of n? Justify your answers.

Enter your answers and your justification in the space provided.

Task 5 (Calculator allowed)

Functions f and g are defined as $f(x) = 2^x$ and $g(x) = x + 3$.

What are the values of x to the nearest hundredth when $f(x) = g(x)$?

Enter your answers in the boxes.

$x_1 =$ ☐

$x_2 =$ ☐

Task 6 (Calculator allowed)

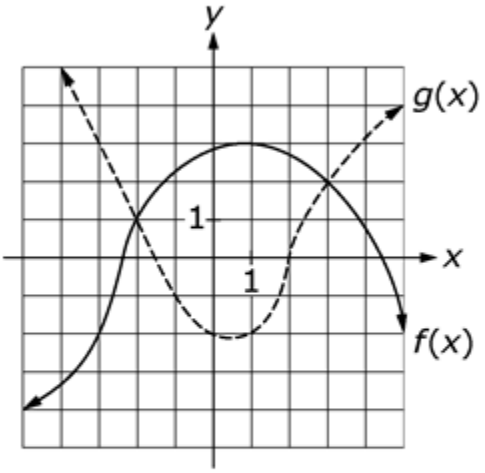
Let $f(x) = -x + 3$ and $g(x) = 3|x| - 1$. Where do the graphs of $f(x)$ and $g(x)$ intersect?

Enter your answer in the boxes.

(☐ , ☐) (☐ , ☐)

Task

Based on the graph below, which of the following is the solution to the equation $f(x) = g(x)$?



a. $-2 < x < 3$
b. $x < -2$ or $x > 3$
c. $x = -2$ or $x = 3$
d. $x = 1$ or $x = 2$

Example 1: Solve the system algebraically

$$\begin{cases} y = -x^2 + 5x + 6 \\ y = x + 6 \end{cases}$$

Mini lesson/review : (model how to solve a system of three linear equation in TWO variables)

Example 2:

Solve the system

$$\begin{cases} 2y - 3z = 0 \\ x + 3y = -4 \\ 3x + 4y = 3 \end{cases}$$

Example 3: Solve the system

$$\begin{cases} x - 2y + z = -4 \\ -4x + y - 2z = 1 \\ 2x + 2y - z = 10 \end{cases}$$

PARCC Practice question

Task 1 (calculator allowed)

Solve the system of equations below for x, y, and z.

$$\begin{cases} 4x - 2y + 3z = 9 \\ x - 2y = -3 \\ 2x + 3y = 1 \end{cases}$$

Enter your answers in the boxes.

$x =$ ☐ $y =$ ☐ $z =$ ☐

Task 2 (calculator allowed

What is the value of z in the solution of the system of linear equations?

$$\begin{cases} x - 9y + 4z = 1 \\ -2x + 9y - 4z = -3 \\ 2x + y - 4z = -3 \end{cases}$$

Task 3: **(NON- CALCULATOR)**

$$y = 2x + 5$$
$$y = x^2 + 4x - 10$$

Part A Solve the system of equations above algebraically. Show your work.

Solution set: _____

Part B Graph both equations and indicate the solution on the graph.