Waynesville R-VI

Math Scope and Sequence 2021-2022

Algebra 2

		1st Semester				2nd Semester					
Days		12	16	18	37	22	19	23	13	5	5
Month(s)		8/23-9/8	9/9-9/30	10/1-10/26	10/27-1/7	1/10-2/9	2/10-3/9	3/10-4/19	4/20-5/6	5/9-5/13	5/16-5/20
Topics											
Unit 1	Foundational Functions	SA Ans. Key									
Unit 2	Square Root Functions		SA Ans. Key								
Unit 3	Pre-Quadratic Topics			SA Ans. Key							
Unit 4	Quadratic Functions				SA Ans. Key						
Unit 5	Polynomial Functions					SA Ans. Key					
Unit 6	Radical Functions, Rational Exponents & Inverses						SA Ans. Key				
Unit 7	Exponential & Logarithmic Functions							SA Ans. Key			
Unit 8	Rational Functions								SA Ans. Key		
Unit 9	Absolute Value									SA Ans. Key	
Unit 10	Statistics										SA Ans. Key

Standards Guide

Item Specifications

Algebra 2 RT1 Foundational Functions

Grade: 10-12 **Subject:** Math **Month(s):** 8/23-9/8 **Days:** 12 **Topic:** 1-1

Standards

Reporting Topic	Foundational Functions		Expectation Unwrapped
Priority Standard	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	• The student will identify the following key characteristics of functions from graphs, tables and equations: domain, range, ~~end behavior~~, x- and y-intercepts, ~~local maxima and minima values~~, ~~symmetries, points of discontinuity,~~ intervals of increasing and decreasing, ~~and horizontal and vertical asymptotes.~~ • The student will be able to represent a given function as a table, equation or graph. • The student will be able to determine specific values of a function from a table, graph, or equation.
Supporting Standards	A2.IF.A.2	Translate between equivalent forms of functions.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
Supporting Standards	A2.IF.A.2		No	Polynomials should not exceed degree four.

Tasks/Learning Progression

Task 1: I can graph and write sets of numbers using inequality, interval and set builder notation
Task 2: I can analyze graphs of functions and identify key features (domain and range, intercepts, positive/negative, increasing/decreasing) Pg 10:1-11 (Notes)Pg 10:18-27, 12-15 (HW)
Task 3: I can evaluate functions (table, graph, equations)
Task 4: Review
Task 5: Summative (Pearson Algebra 2 textbook pg. 69A and 69B)

Key Vocabulary

domain	range	relation	function	vertical line test
Function notation	maximum	minimum	increasing	decreasing
x-intercept	y-intercept	inequality notation	interval notation	set-builder notation

Common Assessments Go to the Scope and Sequence

Pre-Algebra 2 Skills	PS1 FA1 Functions, Domain & Range	PS1 FA2	PS1 SA1 Functions

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ●	●
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	●
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Translate between equivalent forms of functions. ● Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	●
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	

Square Root Functions

Grade: 10-12 **Subject:** Math **Month(s):** 9/9-9/30 **Days:** 16 **Topic:** 5-1-5.4

Standards

Reporting Topic	Square Root Functions		Expectation Unwrapped
Priority Standard	A2.NQ.A.4	Solve equations involving ~~rational exponents and/or~~ radicals and identify situations where extraneous solutions may result.	• The student will solve equations involving rational exponents. • The student will solve equations involving radical expressions. • The student will check for and identify extraneous solutions.
	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic, cubic,~~ square ~~and cube~~ root, ~~absolute value, exponential and logarithmic functions~~.	• The student will describe the effects of transformations algebraically using a, h, and k, given an equation in the form f(x)=a(x-h)+k, or given other general forms of the functions listed. • The student will describe the effects of transformations graphically using terms such as horizontal or vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation. • The student will create equations from the linear, quadratic, cubic, square and cube root, and absolute value, exponential and logarithmic parent functions that produce the above listed transformations. • The student will create graphs from the linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic parent graphs that demonstrate vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation.
Supporting Standards	A2.NQ.A.3	Add, subtract, multiply and divide radical expressions. **(square roots only)**	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.NQ.A.4		Yes	Resulting polynomials to solve should not exceed degree two. Equations can contain one or two radicals. Expressions with rational exponents should be set equal to a constant.
	A2.BF.A.3		Yes	Use a value of $-3 \le a \le 3$. Use h and k values of $-10 \le h \le 10$ and $-10 \le k \le 10$. Referencing a reflection should be "across" a line not "over" a line.
Supporting Standards	A2.NQ.A.3		Yes	Expressions should include those that are numeric and algebraic. Radical indices should be no more than five. No more than two distinct variables. Coefficients between negative six hundred twenty-five and six hundred twenty-five.

Square Root Functions

Tasks/Learning Progression

Task 1: Students can simplify radicals of index 2, both with numbers and variables. (5-1)

Task 2: Students can review addition, subtraction, and multiplication of radicals, and can rationalize denominators with radicals using conjugates (pg. 252 - 254).

Task 3: Students can graph radicals using transformations (including horizontal stretches and compressions) and state a graph's domain and range. Pg 260:4-9, 17-21,26-27, 11-12 (5-3)

Task 4: Students can solve radical equations and can identify when an equation has extraneous solutions (pg. 269-271). (5-4)

Key Vocabulary

radical, Index, & radicand	domain & range	transformations	extraneous solutions	conjugate

Common Assessments Go to the Scope and Sequence

RT2 FA1 Simplify Radicals and Operations	RT2 FA2 Graphing and Solving Radical Functions and Equations	RT2 SA1 Square Root Functions

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** •	•
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** • Solve equations involving ~~rational exponents and/or~~ radicals and identify situations where extraneous solutions may result. • Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic, cubic,~~ square ~~and cube~~ root, ~~absolute value, exponential and logarithmic functions~~.	•
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** • Add, subtract, multiply and divide radical expressions. **(square roots only)**	•
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	

Pre-Quadratic Topics

Grade: 10-12 **Subject:** Math **Month(s):** 10/1-10/26 **Days:** 18 **Topic:** 2-4

Standards

Reporting Topic	Pre-Quadratic Topics		Expectation Unwrapped
Priority Standard	A2.NQ.B.6	Add, subtract, multiply and divide complex numbers.	• The student will add and subtract complex numbers with answers given in $aa + bbbb$ form. • The student will multiply complex numbers with answers given in $aa + bbbb$ form. • The student will divide complex numbers with answers given in $aa + bbbb$ form, using conjugates to rationalize the denominator
	A2.APR.A.1	Extend the knowledge of factoring to include factors with complex coefficients.	• The student will extend the knowledge of factoring to completely factor general polynomial expressions. • The student will factor simple expressions that require complex coefficients, such as $xx2 + 16 = (xx + 4ii)(xx - 4ii)$.
Supporting Standards	A2.NQ.B.5	Represent complex numbers.	Listed on the item specification linked to the standard's code
	A2.NQ.A.2	Create and recognize equivalent expressions involving radical and exponential forms of expressions.	Listed on the item specification linked to the standard's code
	A2.FM.A.1	Create functions and use them to solve applications of quadratic ~~and exponential~~ function modeling problems.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.NQ.B.6		Yes	While simplified answers may have fractional aa and/or bb values, given problems should use integer values for aa and bb. When multiplying and dividing, limit a and b to values between negative twelve and twelve. Items requiring $aa + bbbb$ would include items like $(2 + 2ii)/4$ which should be written as $1/2 + 1/2ii$.
	A2.APR.A.1		Yes	Any of the following factoring problems can be assessed: difference of squares, trinomials, sum of cubes, difference of cubes, GCF, factor by grouping and quartic with no more than four terms.
Supporting Standards	A2.NQ.B.5		Yes	Items requiring $aa + bbbb$ would include items like $(2 + 2ii)/4$ which should be written as $1/2 + 1/2ii$.
	A2.NQ.A.2		No	Denominators should be limited to natural numbers of ten or less. Coefficients negative one thousand to one thousand. No more than three distinct variables. Indices on radicals should not exceed five.
	A2.FM.A.1		Yes	

Tasks/Learning Progression

Task 1: Use the properties of exponents to simplify expressions.
Task 2: Simplify square root expressions.
Task 3: Add, subtract, multiply, and divide with square roots.
Task 4: Perform operations with complex numbers (EnVision Alg. 2 Book pg 100: 14-45, 1-4).
Task 5: Perform operations on polynomial expressions (EnVision Alg. 2 Pgs. 92-92).
Task 6: Factor quadratics (EnVision Alg. 2 Pgs. 92 - 93).
Task 7: Summative Assessment (EnVision Algebra 2 pgs. 127A, 127B).

Key Vocabulary

complex conjugates	like radicals	complex numbers	reduced radical form	imaginary number
index	imaginary unit i	nth root	radical symbol	radicand

Common Assessments Go to the Scope and Sequence

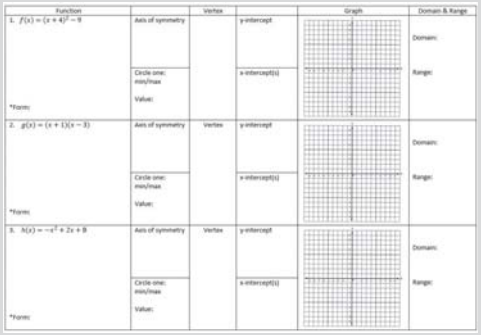
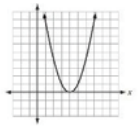
Pre				Post

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ● Analyzes the mathematical relationships of functions to make a connection from real world situations to the model and explain the choice of the function used.	● Stomp rocket lab, basketball activity
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		

Pre-Quadratic Topics

Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Interprets key characteristics of functions from multiple representations; Translate between different but equivalent forms of functions; creates new functions using the four arithmetic operations, describes the effects of multiple transformations on functions both algebraically and graphically; creates functions and use them to solve applications of quadratic modeling problems. Completely factor polynomials.	
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Create new functions using the operations of addition, subtraction, and multiplication; identifies the effects of single transformations in various functions; identifies which model would represent a given situation; identifies key characteristics of polynomial functions ● Sketches the graph of a polynomial in completely factored form	$x^3 + 6x^2 + 4x + 24$ $2x^2 - 18$ $10x^2 + 13x - 3$ $2(x^2 - 9)$ $(x^2 + 4)(x + 6)$ $(2x + 3)(5x - 1)$ $(x + 2)(x - 2)(x + 6)$ $(2x - 3)(5x + 1)$ $2(x + 3)(x - 3)$
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.** ● Graph functions; identifies a single transformation performed on various functions; identifies which model (linear, quadratic, and exponential) would represent a given situation graphically.	Which function is represented by the graph shown at right? A. $y = (x-4)$ B. $y = x^2 - 4$ C. $y = \lvert x-4 \rvert$ D. $y = (x-4)^2$ 

Quadratic Functions

Grade: 10-12 **Subject:** Math **Month(s):** 10/27-1/7 **Days:** 37 **Topic:**

Standards

Reporting Topic	Quadratic Functions		Expectation Unwrapped
Priority Standard	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	• The student will identify the following key characteristics of functions from graphs, tables and equations: domain, range, end behavior, x- and y-intercepts, local maxima and minima values, symmetries, points of discontinuity, intervals of increasing and decreasing, and horizontal and vertical asymptotes. • The student will identify these key characteristics for general polynomials, square roots, cube roots, absolute value of linear functions, simple piece-wise defined, step functions, exponential, logarithmic, and rational functions. • The student will be able to represent a given function as a table, equation or graph. • The student will be able to determine specific values of a function from a table, graph, or equation.
	A2.REI.A.1	Create and solve equations and inequalities, including those that involve absolute value. **(quadratic only)**	• The student will solve exponential equations that do not require logarithms. • The student will write an equation or inequality to model a context. • The student will create equations that may include but is not limited to: linear, quadratic, cubic, exponential, step, and absolute value. • The student will solve equations that may include but is not limited to: linear, quadratic, cubic, exponential, and absolute value. • The student will create equations that may include but is not limited to: linear, quadratic, cubic, exponential, step, and absolute value. • The student will solve inequalities that may include but is not limited to: linear, quadratic, cubic, exponential, and absolute value. • The student may use algebraic and/or graphical methods to solve these problems.
Supporting Standards	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear,~~ quadratic, ~~cubic, square and cube root, absolute value, exponential and logarithmic functions.~~	Listed on the item specification linked to the standard's code
	A2.IF.A.2	Translate between equivalent forms of functions.	Listed on the item specification linked to the standard's code
	A2.FM.A.1	Create functions and use them to solve applications of quadratic and ~~exponential~~ function model problems.	Listed on the item specification linked to the standard's code

	A2.APR.A.5	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial.	Listed on the item specification linked to the standard's code
	A2.REI.B.3	Create and solve systems of equations that may include non-linear equations and inequalities.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes
	A2.REI.A.1		Yes	Absolute value equations and inequalities should be limited to variables to the first power. (e.g., -5|x-4|+2 = -20) Inequalities will be limited to linear, quadratic and absolute value functions.
Supporting Standards	A2.BF.A.3		Yes	Use a values of $-3 \le aa \le 3$. Use h and k values of $-10 \le \hbar \le 10$ and $-10 \le kk \le 10$. Referencing a reflection should be "across" a line not "over" a line.
	A2.IF.A.2		Yes	Polynomials should not exceed degree four.
	A2.FM.A.1		Yes	
	A2.APR.A.5		Yes	Polynomials should be no greater degree than four. Intercepts should be written as ordered pairs in items and in responses
	A2.REI.B.3		No	Systems of equations should be limited to: linear – linear (writing the system is required), linear – linear – linear, linear – quadratic, quadratic – quadratic and non-linear – non-linear. Systems of equations should only have three or fewer unknowns. If circles are used the equations should be given in $(xx - h)2 + (yy - kk)2 = rr2$ form.

Tasks/Learning Progression

Task 1: Graph quadratic functions in vertex form (EnVision Alg. 2 Pg. 77: 1-7, 14-26).
Task 2: Graph quadratic functions in standard form (EnVision Alg. 2 Pg. 85: 5-11, 16-21, 27).
Task 3: Graph quadratic functions in factored (intercept) form (EnVision Alg. 2 Pgs. 92 - 93).
Task 4: Graph quadratic inequalities in all forms.
Task 5: Solve quadratic equations by graphing.
Task 6: Solve quadratic equations by factoring (Pg. 93: 7-9, 23-31).
Task 7: Solve quadratic equations by square root property.
Task 8: Solve quadratic equations by completing the square(pg. 107-109).
Task 9: Solve quadratic equations by quadratic formula (pg. 114: 6-8, 11, 22-25).
Task 10: Solve quadratic inequalities.
Task 11: Summative (EnVision Pgs. 127A and 127B)

Key Vocabulary

discriminant	parabola	vertex form of a quadratic	standard form of a quadratic	zero product property
The Quadratic Formula	square root property	completing the square		

Common Assessments Go to the Scope and Sequence

				Post

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ●	●
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems. ● Create and solve equations and inequalities, including those that involve absolute value. **(quadratic only)**	●
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear,~~ quadratic, ~~cubic, square and cube root, absolute value, exponential and logarithmic functions.~~ ● Translate between equivalent forms of functions. ● Create functions and use them to solve applications of quadratic and ~~exponential~~ function model problems. ● Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial. ● Create and solve systems of equations that may include non-linear equations and inequalities.	●

Quadratic Functions

1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	

Polynomial Functions

Grade: 10-12 **Subject:** Math **Month(s):** 1-10-2-9 **Days:** 22 **Topic:**

Standards

Reporting Topic	Polynomial Functions		Expectation Unwrapped
Priority Standard	A2.APR.A.2	Understand the Remainder Theorem and use it to solve problems.	• The student will divide polynomials, using long division and synthetic division, by given factors or zeros to determine other factors. • Students will understand that a remainder of zero indicates the divisor is a factor of the dividend. • Students will understand that a remainder other than zero indicates the divisor is not a factor of the dividend. • Students will express the result as a quotient with a remainder.
	A2.APR.A.5	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial.	• The student will factor polynomials and use the zero-product property to identify the zeros. • The student will use the zeros and other key characteristics to sketch the function defined by the polynomial.
	A2.NQ.B.7	Know and apply the Fundamental Theorem of Algebra (a polynomial of nth degree will have exactly n roots, including repeated roots).	• The student will recognize that the degree of a polynomial determines the number of solutions. (real + imaginary) • The student will understand that complex solutions always occur in pairs. • The student will understand that factors repeated n times have a multiplicity of n.
Supporting Standards	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	Listed on the item specification linked to the standard's code
	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic,~~ cubic, ~~square and cube root, absolute value, exponential and logarithmic functions~~.	Listed on the item specification linked to the standard's code
	A2.BF.A.1	Create new functions by applying the four arithmetic operations and composition of functions (modifying the domain and range as necessary).	Listed on the item specification linked to the standard's code
	A2.NQ.A.3	Add, subtract, multiply and divide radical expressions. (square roots only)	Listed on the item specification linked to the standard's code
	A2.REI.B.3	Create and solve systems of equations that may include non-linear equations and inequalities.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.APR.A.2		Yes	Divisors should not be greater than degree two. Dividends should not be greater than degree four.
	A2.APR.A.5		Yes	Polynomials should be no greater degree than four. Intercepts should be written as ordered pairs in items and in responses.
	A2.NQ.B.7		Yes	Polynomial equations should contain integer coefficients. Degree of five or less on given polynomial.
Supporting Standards	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
	A2.BF.A.3		Yes	Use a values of $-3 \leq aa \leq 3$. Use h and k values of $-10 \leq \hbar \leq 10$ and $-10 \leq kk \leq 10$. Referencing a reflection should be "across" a line not "over" a line
	A2.BF.A.1		Yes	The number of functions to compose should be restricted to two. Domains and ranges will be given in word form (i.e., all reals) or as inequalities. The degree of the polynomials to be composed should be no greater than a linear function with a quadratic function. Items may contain $ff(gg(xx))$ and $ff \circ gg(xx)$ notation
	A2.NQ.A.3		Yes	Expressions should include those that are numeric and algebraic. Radical indices should be no more than five. No more than two distinct variables. Coefficient s between negative six hundred twenty-five and six hundred twenty-five.
	A2.REI.B.3		Yes	The student will write a system of equations to model a context or setting that may include non-linear equations and inequalities. The student will solve systems of equations that may include non-linear equations and inequalities.

Tasks/Learning Progression

Task 1: Students can apply and combine a variety of exponent rules, including negative exponents.

Task 2: Students can identify key features of a polynomial graph, including end behavior, relative maxima or minima, etc, in some cases using technology (pg. 136 - 138).

Task 3: Students can identify real zeros from a polynomial, including their multiplicity, and can determine if imaginary zeros exist (pg. 136 - 138).

Task 4: Students can factor higher degree polynomials and can solve polynomials using factoring (pg. 151 - 153).

Task 5: Students can perform operations with polynomials, including long division, and can decide if one polynomial is a factor of another using remainders (pg. 159 - 161).

Task 6: Students can use synthetic division and can use the remainder theorem to evaluate polynomial functions (pg. 159 - 161).

Task 7: Students can solve polynomials using technology (to identify possible rational roots) and division.

Polynomial Functions

Key Vocabulary

exponents	end behavior	maxima & minima	zeros	multiplicity
imaginary zeros	long division	synthetic division	remainder theorem	rational vs imaginary roots

Common Assessments Go to the Scope and Sequence

RT5 FA1 Exponents & Polynomial Graphs	RT5 FA2 Factor and Solve Polynomials	RT5 FA3 Solving & Division	RT5 Solving & Polynomial Operations	RT5 SA1 Polynomial Functions

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ●	●
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes). The student will:** ● Understand the Remainder Theorem and use it to solve problems. ● Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial. ● Know and apply the Fundamental Theorem of Algebra (a polynomial of nth degree will have exactly n roots, including repeated roots).	●
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes. The student will:** ● Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems. ● Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic,~~ cubic, ~~square and cube root, absolute value, exponential and logarithmic functions~~. ● Create new functions by applying the four arithmetic operations and composition of functions (modifying the domain and range as necessary). ● Create and solve systems of equations that may include non-linear equations and inequalities.	●
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	

RT6 Radical Functions Rational Exponents & Inverses

Grade: 10-12 **Subject:** Math **Month(s):** 2-10-3-9 **Days:** 19 **Topic:**

Standards

Reporting Topic	Radical Functions Rational Exponents & Inverses		Expectation Unwrapped
Priority Standard	A2.NQ.A.4	Solve equations involving rational exponents and/or radicals and identify situations where extraneous solutions may result.	• The student will solve equations involving rational exponents. • The student will solve equations involving radical expressions. • The student will check for and identify extraneous solutions.
	A2.NQ.A.3	Add, subtract, multiply and divide radical expressions.	• The student will be able to perform operations with radical expressions, including those that require simplifying prior to combining terms. • The student will use conjugates to simplify rational expressions containing radicals in the denominator.
	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic, cubic,~~ square and cube root, ~~absolute value, exponential and logarithmic functions~~.	• The student will describe the effects of transformations algebraically using a, h, and k, given an equation in the form f(x)=a(x-h)+k, or given other general forms of the functions listed. • The student will describe the effects of transformations graphically using terms such as horizontal or vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation. • The student will create equations from the linear, quadratic, cubic, square and cube root, and absolute value, exponential and logarithmic parent functions that produce the above listed transformations. • The student will create graphs from the linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic parent graphs that demonstrate vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation.
	A2.NQ.A.2	Create and recognize equivalent expressions involving radical and exponential forms of expressions.	• The student will be able to convert from radical form to rational exponent form. • The student will be able to convert from rational exponent form to radical form. • The student will recognize that radical form and rational exponent forms are equivalent. • The student will be able to simplify radical expressions. The student will be able to simplify expressions with rational exponents
Supporting Standards	A2.BF.A.1	Create new functions by applying the four arithmetic operations and composition of functions (modifying the domain and range as necessary).	Listed on the item specification linked to the standard's code
	A2.NQ.A.1	Extend the system of powers and roots to include rational exponents.	Listed on the item specification linked to the standard's code
	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	Listed on the item specification linked to the standard's code

	A2.IF.A.2	Translate between equivalent forms of functions.	Listed on the item specification linked to the standard's code
	A2.BF.A.2	Derive inverses of functions, and compose the inverse with the original function to show that the functions are inverses.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.NQ.A.4		Yes	Resulting polynomials to solve should not exceed degree two. Equations can contain one or two radicals. Expressions with rational exponents should be set equal to a constant.
	A2.NQ.A.3		Yes	Expressions should include those that are numeric and algebraic. Radical indices should be no more than five. No more than two distinct variables. Coefficient s between negative six hundred twenty-five and six hundred twenty-five.
	A2.BF.A.3		Yes	Use a values of $-3 \le aa \le 3$. Use h and k values of $-10 \le \hbar \le 10$ and $-10 \le kk \le 10$. Referencing a reflection should be "across" a line not "over" a line
	A2.NQ.A.2		Yes	Denominators should be limited to natural numbers of ten or less. Coefficients negative one thousand to one thousand. No more than three distinct variables. Indices on radicals should not exceed five.
Supporting Standards	A2.BF.A.1		Yes	The number of functions to compose should be restricted to two. Domains and ranges will be given in word form (i.e., all reals) or as inequalities. The degree of the polynomials to be composed should be no greater than a linear function with a quadratic function. Items may contain $ff(gg(xx))$ and $ff \circ gg(xx)$ notation.
	A2.NQ.A.1		Yes	Exponent denominators should be limited to natural numbers of ten or less. Coefficients negative one thousand to one thousand. No more than three distinct variables.
	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
	A2.IF.A.2		No	Polynomials should not exceed degree four.
	A2.BF.A.2		Yes	Limit functions to linear, quadratic, exponential, logarithmic and cubic. Cubic functions will be limited to $ff(xx) = aaxx3 +$ □

RT6 Radical Functions Rational Exponents & Inverses

Tasks/Learning Progression

Task 1: Students can simplify radicals of index 3 & 4, both with numbers and variables (pg. 244-246).
Task 2: Students can review addition, subtraction, and multiplication of radicals, and can rationalize denominators with radicals using conjugates (pg. 252 - 254).
Task 3: Students can switch between radical form and rational exponent form, and can simplify expressions with rational exponents using exponent rules.
Task 4: Students can define function composition and inverse functions, and can use function composition to determine if two functions are inverses (pg. 287-289).
Task 5: Students can graph radicals using transformations (including horizontal stretches and compressions) and state a graph's domain and range. Pg 260:4-9, 17-21,26-27, 11-12
Task 6: Students can solve radical equations and can identify when an equation has extraneous solutions (pg. 269-271).
Task 7: Summative (EnVision Alg.2 pg. 293A and 293B).

Key Vocabulary

radials	index	Rational exponents	conjugate	Radical division
inverse functions	function composition	extraneous solutions		

Common Assessments Go to the Scope and Sequence

RT7 FA1 Operations with Radicals	RT7 FA2 Functions Composition & Inverses	RT7 SA1 Radicals & Inverses

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ● Analyzes where extraneous solutions may occur	For #9-10, solve: 9. $\sqrt{3x-7} = -4$
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes). The student will:** ● Simplify expressions & solve equations involving rational exponents and/or radicals and identify extraneous solutions ● Interprets key characteristics of functions from multiple representations ● Translate between different but equivalent forms of functions; creates new functions using the four arithmetic operations, including composition and inverses of functions considering the effects on the domain and range ● shows whether two nonlinear functions are inverses of each other ● describes the effects of multiple transformations on functions both algebraically and graphically ● creates functions and uses them to solve applications of quadratic and exponential function modeling problems.	14. Given $f(x) = x + 3$ and $g(x) = x^2 - 5$, find $g(f(x))$. Simplify completely. Write answer in standard form. 12. For the given function, $g(x)$, circle **all** of the transformations from the parent function, $f(x) = \sqrt{x}$, that apply. There will be more than one answer. $g(x) = -\frac{1}{3}\sqrt{x-2} + 8$ a. Reflection across the x-axis b. Reflection across the y-axis c. Vertical stretch of 3 d. Vertical compression of $\frac{1}{3}$ e. Horizontal stretch of 3 f. Horizontal compression of $\frac{1}{3}$ g. Translation right 2 h. Translation left 2 i. Translation up 8 j. Translation down 8
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes. The student will:** ● Add, subtract, multiply and divide radical expressions	$(2+\sqrt{5})(3-\sqrt{5})$
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	

Exponential & Logarithmic Functions

Grade: 10-12 **Subject:** Math **Month(s):** 3-10-4-19 **Days:** 23 **Topic:**

Standards

Reporting Topic	Exponential & Logarithmic Functions		Expectation Unwrapped
Priority Standard	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	• The student will identify the following key characteristics of functions from graphs, tables and equations: domain, range, end behavior, x- and y-intercepts, local maxima and minima values, symmetries, points of discontinuity, intervals of increasing and decreasing, and horizontal and vertical asymptotes. • The student will identify these key characteristics for general polynomials, square roots, cube roots, absolute value of linear functions, simple piece-wise defined, step functions, exponential, logarithmic, and rational functions. • The student will be able to represent a given function as a table, equation or graph. • The student will be able to determine specific values of a function from a table, graph, or equation.
	A2.SSE.A.2	Use the inverse relationship between exponents and logarithms to solve exponential and logarithmic equations.	• The student will use the inverse relationship between exponents and logarithms to solve simple exponential equations. • The student will use the inverse relationship between exponents and logarithms to solve simple logarithmic equations.
	A2.SSE.A.1	Develop the definition of logarithms based on properties of exponents.	• The student will develop the definition of logarithms logbb yy = xx if and only if $bbxx$ = yy, based on properties of exponents. • The student will be able to convert equations from exponential to logarithmic form. • The student will be able to convert equations from logarithmic to exponential form.
	A2.FM.A.1	Create functions and use them to solve applications of ~~quadratic~~ and exponential function modeling problems.	• The student will create quadratic or exponential equations to model problems. • The student will solve quadratic or exponential equations to determine solutions to problems algebraically or graphically. • e.g. Price-demand-cost-revenue—profit situations, compound interest problems, and exponential growth or decay problems.
Supporting Standards	A2.SSE.A.3	Use properties of logarithms to solve equations or find equivalent expressions.	Listed on the item specification linked to the standard's code
	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for ~~linear, quadratic, cubic, square and cube root, absolute value,~~ exponential and logarithmic functions.	Listed on the item specification linked to the standard's code

	A2.SSE.A.4	Understand why logarithmic scales are used, and use them to solve problems.	Listed on the item specification linked to the standard's code
	A2.IF.A.2	Translate between equivalent forms of functions.	Listed on the item specification linked to the standard's code
	A2.REI.A.1	Create and solve equations and inequalities, including those that involve absolute value. (exponential and logarithmic equations)	Listed on the item specification linked to the standard's code
	A2.BF.A.2	Derive inverses of functions and compose the inverse with the original function to show that the functions are inverses.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
	A2.SSE.A.2		Yes	The expressions used as exponents should not exceed linear. The expression used in logarithms should not exceed linear cc lognn($aaaa$ + bb)=mm, where n or m are integers and c is a constant.
	A2.SSE.A.1		Yes	Bases should be greater than zero.
	A2.FM.A.1		Yes	
Supporting Standards	A2.SSE.A.3		Yes	Base is greater than zero. No more than three distinct variables in expanding and condensing problems. Equations should be have no more than two terms on one side of the equation and one term on the other side. Equations should have the same base throughout.
	A2.BF.A.3		Yes	Use a values of −3 ≤ aa ≤ 3. Use h and k values of −10 ≤ $ℏ$ ≤ 10 and −10 ≤ kk ≤ 10. Referencing a reflection should be "across" a line not "over" a line
	A2.SSE.A.4		Yes	Base is greater than zero. When giving formulas, all variables should be defined.
	A2.IF.A.2		No	Polynomials should not exceed degree four.
	A2.REI.A.1		No	Absolute value equations and inequalities should be limited to variables to the first power. (e.g., -5|x-4|+2 = -20) Inequalities will be limited to linear, quadratic and absolute value functions.
	A2.BF.A.2		No	Limit functions to linear, quadratic, exponential, logarithmic and cubic. Cubic functions will be limited to ff(xx) = $aaxx$3 + □

Tasks/Learning Progression

Task 1: Graph exponential functions (pg. 302-304)
Task 2: Solve exponential equations (common bases) (pg. 302-304)
Task 3: Write and solve exponential equations to model real-world problems(pg. 310-312).
Task 4: Convert between exponential and logarithmic form (pg. 318 - 320).
Task 5: Graph logarithmic functions (pg. 324-326).
Task 6: Solve exponential equations (different bases)(pg. 337-339).
Task 7: Apply the properties of logarithms (pg. 330-332).
Task 8: Solve logarithmic equations (pg. 337-339)
Task 9: Summative (pg. 353A-353B).

Key Vocabulary

domain	range	vertical asymptote	horizontal asymptote	compound interest
exponential growth	exponential decay	logarithm	common logarithm	natural logarithm
exponential form	logarithmic form	inverse properties	change of base formula	extraneous solution

Common Assessments Go to the Scope and Sequence

RT7 FA1 Graph Solve Exponential	RT7 Logarithms	RT7 SA1 Exponential & Logarithmic Functions

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ● Analyze logarithmic scales in the context of the situation by examining the constraints and relationship to make conjectures about the meaning of the solution. ● Analyzes the mathematical relationships of functions to make a connection from real world situations to the model and explain the choice of the function used.	17. Find the balance in an account if the initial amount invested is $1000 at a rate of 6.5%. Write a function to model the value of the account for each situation and find the value. *Show your work.* a) Find the balance after 10 years if the interest is compounded monthly. b) Find the balance after 10 years if the interest is compounded continuously. c) Given compounded continuously, how many years does it take for the balance in the account to reach $3000.
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Simplify logarithmic expressions ● solves logarithmic & exponential equations ● uses logarithmic scales to solve problems ● Interprets key characteristics of functions from multiple representations	Write as a single logarithm (condense), simplify 6. $\log_5 50 - \log_5 2$ Solve the logarithmic equations and **check for extraneous solutions.** 11. $2\log_3(2x-1) = 4$
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Translates between exponential & logarithmic forms ● evaluates logarithms.	10. ***Multiple Choice:*** Write the equation $4^3 = 64$ in logarithmic form. A) $\log_4 3 = 64$ B) $\log_3 4 = 64$ C) $\log_{64} 4 = 3$ D) $\log_4 64 = 3$
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.** ● Knows the definition of logarithms based on properties of exponents.	Evaluate. 4. $\ln e^{3.82} =$

RT10 Statistics

Grade: 10-12 **Subject:** Math **Month(s):** 5/16-5/120 **Days:** 5 **Text:**

Standards

Reporting Topic	Absolute Value		Expectation Unwrapped
Priority Standard	A2.DS.B.8	Know and use the characteristics of normally distributed data sets; predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean.	• The student will know and be able to use the 68-95-99.7 rule to determine the percentages of data above or below the mean for given standard deviations. • The student will be able to draw and label the normal curve with values on the horizontal axis when given the mean and standard deviation. • The student will be able to draw and label the standard normal curve with percentages using the empirical rule (68-95-99.7 rule).
	A2.DS.A.1	Analyze how random sampling could be used to make inferences about population parameters.	• The student will understand random sampling. • The student will explain how a random sample can be used to make an inference about a population. • The student will analyze situations to determine if random sampling was used.
Supporting Standards	A2.DS.B.9	Fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed.	Listed on the item specification linked to the standard's code
	A2.DS.A.7	Evaluate reports based on data.	Listed on the item specification linked to the standard's code
	A2.DS.A.5	Describe and explain how the relative sizes of a sample and the population affect the margin of error of predictions.	Listed on the item specification linked to the standard's code
	A2.DS.A.3	Describe and explain the purposes, relationship to randomization and differences, among sample surveys, experiments and observational studies.	Listed on the item specification linked to the standard's code
	A2.DS.A.2	Determine whether a specified model is consistent with a given data set.	Listed on the item specification linked to the standard's code
	A2.DS.A.6	Analyze decisions and strategies using probability concepts.	Listed on the item specification linked to the standard's code
	A2.DS.A.4	Use data from a sample to estimate characteristics of the population and recognize the meaning of the margin of error in these estimates.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

Lesson(s)	Assessed on	Instructional Ideas/Prerequisite Knowledge

			Post Test	
Priority Standard	A2.DS.B.8		Yes	Standard deviations should be restricted to integer values from negative three to three.
	A2.DS.A.1		Yes	
Supporting Standards	A2.DS.B.9		Yes	Data sets should be no more than fifty numbers.
	A2.DS.A.7		No	
	A2.DS.A.5		No	The items will not require the calculation of a margin of error.
	A2.DS.A.3		Yes	
	A2.DS.A.2		Yes	Specified models might include dot plots, histograms, frequency tables, lists or simulation result statements.
	A2.DS.A.6		No	
	A2.DS.A.4		Yes	Data samples should be limited at ten. Decimal values should be no more than three places.

Tasks/Learning Progression

Task 1	Identify why random sampling is necessary and how to use it for sample surveys, experiments and observational studies (pg. 562-564).
Task 2	Understand the importance of measures of shape, center, and spread and can review common graphs.
Task 3	Recognize attributes of a Normal distribution and can calculate (simple) probabilities from a Normal distribution with a given mean and standard deviation (pg. 578-580).
Task 4	Make conclusions from a sample using a sample statistic and margin of error, can explain the effect of sample size on margin of error, and can make decisions based on a margin of error (pg. 586 - 589).

Key Vocabulary

fundamental counting rule	dependent events	permutations	disjoint events	combinations
multiplication rule	independent events	addition rule	random sampling or assignment	sample statistic

margin of error	mean	standard deviation	Normal distribution	

Common Assessments Go to the Scope and Sequence

				Post

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ● Determines flaws in reasoning used to solve probability problems in context	
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● calculate probabilities for events, including independent, conditional and joint probabilities such as addition and multiplication rules; describe events as subsets of a sample space using characteristics of the outcomes	A bag contains 4 red marbles, 5 green marbles, and 3 white marbles. What is the probability that you sele a green marble and then a red marble if you don't replace marbles? If you roll a 6-sided number cube, what is the probability that
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Uses permutations and combinations to solve problems;	There are 10 runners in a 2-mile race. How many different ways can 1st, 2nd, and 3rd places be awarded?
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.** ● identify P(A), P(A and B) p (B); knows the difference between permutations and combinations	Jessie has a red shirt, a blue shirt, and a green shirt. She also has a pair of white jeans, a pair of blue jeans, and a pair of burgundy jeans. How many different shirt-pants combinations does Jessie have with exactly 1 shirt and 1 pair of jeans in each combination?

RT8 Rational Functions

Grade: 10-12 **Subject:** Math **Month(s):** 4/20-5/6 **Days:** 13 **Text:**

Standards

Report Card Topic	Rational Functions		Expectation Unwrapped
Priority Standard	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	• The student will identify the following key characteristics of functions from graphs, tables and equations: domain, range, end behavior, x- and y-intercepts, local maxima and minima values, symmetries, points of discontinuity, intervals of increasing and decreasing, and horizontal and vertical asymptotes. • The student will identify these key characteristics for general polynomials, square roots, cube roots, absolute value of linear functions, simple piece-wise defined, step functions, exponential, logarithmic, and rational functions. • The student will be able to represent a given function as a table, equation or graph. • The student will be able to determine specific values of a function from a table, graph, or equation.
	A2.APR.A.4	Add, subtract, multiply and divide rational expressions.	• The student will add and subtract rational expressions, including those with polynomial numerators and denominators, including those unlike denominators. • The student will multiply and divide rational expressions, including those with polynomial numerators and denominators. • Final answers should not have common factors in the numerators and denominators.
Supporting Standards	A2.APR.A.3	Find the least common multiple of two or more polynomials	Listed on the item specification linked to the standard's code
	A2.REI.A.2	Solve rational equations where numerators and denominators are polynomials and where extraneous solutions may result.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
	A2.APR.A.		Yes	Polynomials should not exceed degree four. The number of expressions should not exceed three for an addition, subtraction or multiplication problem.

	4			
Supporting Standards	A2.APR.A.3		No	Factorable polynomials of degree four or less.
	A2.REI.A.2		Yes	Higher degree polynomials should be factorable. Do not exceed degree three. All coefficients should be integers.

Tasks/Learning Progression

Task 1	Simplify, multiply, and divide rational expressions (pg. 214-216).
Task 2	Add and subtract rational expressions (pg. 221-223).
Task 3	Solve rational equations (pg. 229-231).
Task 4	Graph reciprocal functions using transformations and identify key features (pg. 198-200).
Task 5	Summative (pg. 235A-235B)

Key Vocabulary

rational expression	complex fraction	least common denominator	reciprocal function	proportion

Common Assessments Go to the Scope and Sequence

				Post

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ● applies the Fundamental Theorem of Algebra o The student will factor expressions that require complex coefficients. ● The student will extend the knowledge of factoring to completely factor general polynomial expressions. ● Add, subtract, multiply, & divide rational expressions	Find the area of the rectangle:  $\frac{2x}{x^2-12x+27}$ $\frac{x^2-81}{4x^3+36x^2}$
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Add, subtract, multiply, & divide rational expressions	$\frac{m}{m-3}+\frac{5m-48}{m^2+5m-24}$
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● The student will solve rational equations by various methods, including instances when the numerator and denominator are polynomials.	Divide $\frac{x^3-x^2-x+10}{x+2}$ A) x^2+5 B) x^2-3x+5 C) $x^2-3x+7-\frac{4}{x+2}$ D) $x^2+x+1+\frac{12}{x+2}$
1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.** ● The student will check solutions and identify those that are extraneous.	$\frac{x^2-25}{x+5}$

RT9 Absolute Value

Grade: 10-12 **Subject:** Math **Month(s):** 5/9-5/13 **Days:** 5 **Text:**

Standards

Reporting Topic	Absolute Value		Expectation Unwrapped
Priority Standard	A2.REI.A.1	Create and solve equations and inequalities, including those that involve absolute value. **(absolute value and linear only)**	• The student will solve exponential equations that do not require logarithms. • The student will write an equation or inequality to model a context. • The student will create equations that may include but is not limited to: linear, quadratic, cubic, exponential, step, and absolute value. • The student will solve equations that may include but is not limited to: linear, quadratic, cubic, exponential, and absolute value. • The student will create equations that may include but is not limited to: linear, quadratic, cubic, exponential, step, and absolute value. • The student will solve inequalities that may include but is not limited to: linear, quadratic, cubic, exponential, and absolute value. • The student may use algebraic and/or graphical methods to solve these problems.
	A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for linear, ~~quadratic, cubic, square and cube root,~~ absolute value, ~~exponential and logarithmic functions.~~	• The student will describe the effects of transformations algebraically using a, h, and k, given an equation in the form f(x)=a(x-h)+k, or given other general forms of the functions listed. • The student will describe the effects of transformations graphically using terms such as horizontal or vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation. • The student will create equations from the linear, quadratic, cubic, square and cube root, and absolute value, exponential and logarithmic parent functions that produce the above listed transformations. • The student will create graphs from the linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic parent graphs that demonstrate vertical stretch (expansion) or shrink (compression), reflection, horizontal and vertical translation, and dilation.
Supporting Standards	A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	Listed on the item specification linked to the standard's code
	A1.CED.A.3	Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context.	Listed on the item specification linked to the standard's code
	A1.REI.A.1	Explain how each step taken when solving an equation	Listed on the item specification linked to the standard's code

		or inequality in one variable creates an equivalent equation or inequality that has the same solution (s) as the original.	
	A1.REI.C.7	Graph the solution to a linear inequality in two variables.	Listed on the item specification linked to the standard's code

**Click on standard code above to see Item Specifications from DESE and Released Items*

Instructional Ideas/Notes

		Lesson(s)	Assessed on Post Test	Instructional Ideas/Prerequisite Knowledge
Priority Standard	A2.REI.A.1		Yes	Absolute value equations and inequalities should be limited to variables to the first power. (e.g., -5|x-4|+2 = -20) Inequalities will be limited to linear, quadratic and absolute value functions.
	A2.BF.A.3		Yes	Use a values of $-3 \le a \le 3$. Use h and k values of $-10 \le h \le 10$ and $-10 \le k \le 10$. Referencing a reflection should be "across" a line not "over" a line.
Supporting Standards	A2.IF.A.1		Yes	Polynomials should be of no greater degree than four. Intercepts are ordered pairs. Limit rational functions to those without oblique asymptotes.
	A1.CED.A.3		Yes	Equations and inequalities should be limited to linear (in terms of representing constraints).
	A1.REI.A.1		Yes	Emphasis is not on two-column proofs or formal articulation of properties to explain equivalent equations or inequalities. Limited to linear equations and inequalities.
	A1.REI.C.7		No	Limited to integer x- and y-intercepts.

Tasks/Learning Progression

Task 1	Solve absolute value equations (EnVision Alg. 2 pg. 44 - 45).
Task 2	Solve absolute value inequalities (EnVision Alg. 2 pg. 44-45).
Task 3	Graph linear and absolute value equations and inequalities (EnVision Alg. 2 pg. 44 - 45).
Task 4	Summative (EnVision Alg. 2 Pgs. 69A and 69B)

Key Vocabulary

Continues Function	Range	Domain	Absolute Value Equation	Reflectional Symmetry

RT9 Absolute Value

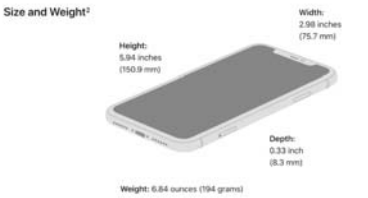
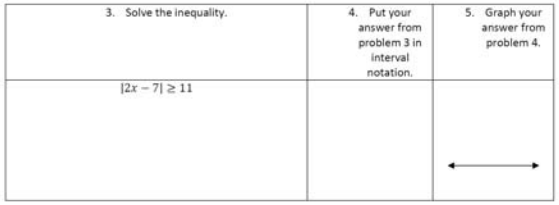
Maximum	Interval Notation	Inequality Notation	Minimum	x- and y-intercept
Standard form	Absolute Value Function			

Common Assessments Go to the Scope and Sequence

				Post

Proficiency Scale

A score of 3.0 correlates with grade-level proficiency on the priority standard.

Score	Learning Goal	Sample Tasks
Score 4.0	**In addition to Score 3.0, in-depth inferences or applications that go beyond what was taught. For example, the student may:** ●	The size and weight specifications for the iPhone 11 are shown here. Apple has a tolerance of 0.005 inches for the height, x, of a phone in order for it to be acceptable. Write and solve an inequality that gives the range of acceptable heights for the iPhone 11.  ●
3.5 In addition to 3.0 performance, in-depth inferences and applications with partial success.		
Score 3.0	**The student exhibits no major errors or gaps in the learning goal (complex ideas and processes).** **The student will:** ● Create and solve equations and inequalities, including those that involve absolute value. (absolute value and linear only) ● Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic functions.	● 13] Given $f(x) = \frac{1}{3}\lvert x - 8\rvert$ and $g(x) = \frac{1}{3}\lvert x + 4\rvert$, which of the following is true? **a)** $f(x)$ is wider than $g(x)$ **b)** $f(x)$ is a right 8 horizontal translation of $g(x)$ **c)** $f(x)$ is a right 12 horizontal translation of $g(x)$ **d)** More than one of the above responses is true
2.5 No major errors or gaps in 2.0 content and partial knowledge of 3.0 content.		
Score 2.0	**The student exhibits no major errors or gaps in the simpler details and processes.** **The student will:** ● Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems. ● Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context. ● Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution (s) as the original. ● Graph the solution to a linear inequality in two variables.	● 

1.5 Partial understanding of the 2.0 content with major errors or gaps in 3.0 content.		
Score 1.0	**With help, a partial understanding of the 2.0 content and some of the 3.0 content.**	12] Which of the following equations represents the function graphed to the right? **a)** $y = \|x - 2\| + 1$ **b)** $y = \|x + 2\| + 1$ **c)** $y = \|x - 2\| - 1$ **d)** $y = \|x + 2\| - 1$