Common Core Algebra II

MRS21 Course Overview (Tentative)

Unit #1	Algebraic Expressions and Operations on Polynomials
Total: 6 days	• Lesson #1: Classifying Polynomials and Evaluating Expressions • Lesson #2: Operations on Polynomials (addition, subtraction, multiplication) • Lesson #3-4: Special Polynomial Identities • Lesson #5-6: Binomial Expansion

Unit #2	Functions and Their Characteristics
Total: 9 days	• Lesson #1: Introduction to Non-Linear Functions • Lesson #2: Function Notation and Composition of Functions • Lesson #3: Domain and Range of a Function • Lesson #4: Inverses of Linear Functions • Lesson #5: Key Features of Functions • Lesson #6: Solving Systems of Equations Graphically (involving higher degree equation given in function notation, discuss 3 cases, use calculator) • Lesson #7-9: System of Three Linear Equations

Unit #3	Quadratic Functions and Their Algebra
Total: 14 days	• Lesson #1: Review of Factoring Methods(GCF, trinomial, special binomials) • Lesson #2: Factoring Completely • Lesson #3: Factoring by Grouping • Lesson #4: Equivalence of Expressions and Functions (see #5, 20 august, #8, #31 june • Lesson #5: Quadratic Function Review • Lesson #6: Completing the Square and Shifting Parabolas • Lesson #7: Intercept Form of Quadratic Function • Lesson #8: Solving Quadratics Using Zero Product Rule • Lesson #9: Modeling with Quadratic Functions • Lesson #10: Solving Systems Involving Lines, Circles, and Parabolas Algebraically (see #33 june • Lesson #11: The Locus Definition of a Parabola • Lesson #12-13: Equation of Parabola with Vertex not at the Origin (Horizontal and Vertical Shift) • Lesson #14: Writing Equation of Parabola Using Locus Definition

Unit #4	Complex Numbers
Total: 5 days	• Lesson #1: Imaginary Number • Lesson #2: Simplifying Powers of i and intro to Complex Numbers • Lesson #3: Operations on Complex Numbers (#27 august • Lesson #4: Solving Quadratic Equations with Complex Solutions • Lesson #5: The Discriminant and the Nature of the Roots

Unit #5	Polynomial Functions and their Algebra
Total: 11 days	• Lesson #1: Long Division of Polynomials • Lesson #2: Synthetic Division of Polynomials • Lesson #3: Application of Synthetic Division of Polynomials • Lesson #4: Remainder and Factor Theorem • Lesson #5: Solving Higher Degree Polynomial Equations • Lesson #6: Writing Equations of Higher Degree Polynomial Functions given their roots • Lesson #7: Graphs and Zeros of Polynomial Functions • Lesson #8-9: Sketching the Graphs of Polynomial Functions • Lesson #10: Even and Odd Functions

Unit #6	Rational Expressions and Equations
Total: 7 days	• Lesson #1: Simplifying Rational Expressions • Lesson #2: Multiplying and Dividing Rational Expressions • Lesson #3-4: Adding and Subtracting Rational Expressions (#17 august • Lesson #5: Complex Fractions • Lesson #6: Solving Rational Equations • Lesson #7: Applications of Rational Equations

Unit #7	Powers and Radicals
Total: 7 days	• Lesson #1: Review of Integer Exponents • Lesson #2: Fractional Exponents • Lesson #3: Properties of Exponents and Radicals • Lesson #4: Simplifying Radical Expressions (#26 august) • Lesson #5: Solving Square Root Equations • Lesson #6: Solving Cube Root, Forth Root Equations, and Equations with Fractional Exponents • Lesson #7: EXTENSION Graphing Square Root and Cube Root Functions

Total: 59 lessons.

On-line resources:

1. eMath instruction lessons: http://emathinstruction.com/common-core-algebra-ii-all-units-first-draft/
2. LearnZillion – CC Standards with aligned on-line lessons: https://learnzillion.com/common_core/math/algebra
3. Mathbitsnotebook:

Unit #1: Algebraic Expressions and Linear Functions

- Lesson #1: Classifying Polynomials and Evaluating Expressions

Standards	
Objectives	- State the degree of a polynomial and the number of terms in a polynomial - Add and subtract expressions with multivariable terms like $-13x^2y^4$ - Evaluate expressions with multivariable terms - Add and subtract polynomials EXTENSION: (see Engage NY Lesson #1 Mod #1) - Determine the 1st, 2nd, and 3rd difference of any second degree or third degree polynomial (n-th degree polynomial will have a constant n-th difference) - Determine the degree of a polynomial given the table of values generated by a polynomial)

Resources	Amsco: p.6-8, p.133-137	eMath: Unit #1 lesson #1
		Engage NY: Lesson #1 Mod #1

- Lesson #2: Multiplying Polynomials

Standards	A-SSE.A.2 & A-APR.C.4 Practice MP.7 & MP.8
Objectives	- Multiply binomials, trinomials, and higher degree polynomials using distributive method - Use distributive property to prove useful identities such as: $(a+b)^2 = a^2 + 2ab + b^2$, $(x^n - y^n)(x^n + y^n) = x^{2n} - y^{2n}$, including $(x-y)(x+y) = x^2 - y^2$ and $(x^2 - y^2)(x^2 + y^2) = x^4 - y^4$ EXTENSION: Multiply polynomial using area model (tabular method)

Resources	Amsco: p.39 – 40, p.137	eMath: Unit #1 lesson #4, 5
IMG 1185	Assessment Readiness p.27	EngageNY: Mod #1 Lesson # 2

- Lesson #3: Special Polynomial Identities

Standards	A-SSE.A.2, A.APR.C.4, & Practice MP.7
Objectives	((including more difficult cases, see #5, 20 august) - Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$* - use the perfect square binomial identity $(x-y)^2 = x^2 - 2xy + y^2$ on more complex problems - Use sum and difference of cubes identities EXTENSION: Use the polynomial identity $(x^2 - y^2)^2 + (2xy)^2 = (x^2 + y^2)^2$ to state Pythagorean triples and their multiples (NOTE: students do need to memorize it, just how to use it)

Resources	Amsco: p.80-88, 93	eMath: unit # 10 lesson #4
	See assessment readiness questions	Engage NY: Mod #1 Lesson #2, #10

Unit #2: Functions and Their Characteristics

- Lesson #1: Introduction to non-Linear Functions

Standards	MP. 8. Look for and express regularity in repeated reasoning. F-IF.1
Objectives	Identify independent and dependent variable

	• Determine whether relation is a function using the vertical line test • Determine if a function is one-to-one (horizontal line test) or onto • Distinguish between different types of functions (linear, quadratic, absolute value, square root, exponential) given their equations and/or graphs
Resources	Amsco: p.48 - 49	eMath: Unit #2 lesson #1, lesson #5 Engage NY:

- Lesson #2: Function Notation and Composition of Functions

Standards	F-IF.1, F-IF.2	
Objectives	• Recognize and interpret different function notations • Given f(x) (linear or quadratic), find f(x-a) or f(x+a) where 'a' is rational number • Evaluate a given function for a given value • Given equations of functions, find composition of functions using two different notations f(g(x)) or f o g(x) • Find composition of functions using graphs of functions	
Resources	Amsco: p.22-24,	eMath: Unit #2 lesson #2, lesson #3 Engage NY:

- Lesson #3: Domain and Range of a Function

Standards	F-IF.1, F-IF.5	
Objectives	• Use set builder or interval notation to represent domain and range of a function given its graph • Given the graph of a function and a value of the domain, find the corresponding value of range • Find range given domain and an equation of linear or quadratic function • Find restricted domain and range of rational and radical functions	
Resources	Amsco:	eMath: unit #2 lesson 4 Engage NY:

- Lesson #4: Inverses of Linear Functions

Standards	F-BF.4	
Objectives	• Define inverse of a function • Find inverse of a linear function algebraically (in a slope-intercept form or point-slope form) and graphically • Find inverse of different functions given a table of values, an equation, or a graph • Explore the inverse relationship of linear functions using graphing calculator EXTENSION: find an inverse of cubic and square root functions	
Resources	Amsco: p.281-285 Pearson: 409-410	eMath: Unit #2 lesson #6, Unit #3 lesson #5

- Lesson #5: Key Features of Functions

Standards	F-IF.4	
Objectives	• Given a graph or an equation, identify x and y-intercepts of the function • State zeros of a function given its graph • State relative and absolute minimum and maximum of a function • Identify increasing and decreasing intervals of a function • State when function is positive (f(x) >0) or negative (f(x)<0) • (end behavior notation)	
Resources	Amsco:	eMath: unit #2 lesson #7 Engage NY:

- Lesson #6: Solving Systems of Equations Graphically

Standards	F-IF.4	
Objectives	(involving higher degree equation given in function notation, discuss 3 cases, use calculator)	
Resources	Amsco:	eMath: unit #2 lesson #7 Engage NY:

- Lesson #7-8: System of Three Linear Equations

Standards	MP 7. Look for and make use of structure. MP 1. Make sense of problems and persevere in solving them.	
Objectives	(#23 august, algebraically, calculator, application) - Solve system of linear equations with three variable by using elimination or substitution - Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. - EXTENSION: Given three points of the parabola, write a quadratic equations for this function	
Resources	Amsco: p.72-74	eMath: Unit #3 lesson #7 Engage NY: Mod 1 lesson #30

Unit #3: Quadratic Functions and Their Algebra

- Lesson #1: Review of Factoring Methods

Standards	N-Q.A.2, A-SSE.A.2, A-APR.B.2, A-APR.B3, A-APR.D.6, F-IF.C.7c. MP 7: Look for and make use of structure	
Objectives	- Factor using GCF - Factor using the difference of two perfect squares - Factor quadratic trinomials with leading coefficient 1 - Factor perfect square trinomials	
Resources	Amsco: p.79 - 80	eMath: unit #6 lesson #2 Engage NY:

- Lesson #2: Factoring Completely

Standards	N-Q.A.2, A-SSE.A.2, A-APR.B.2, A-APR.B3, A-APR.D.6, F-IF.C.7c	
Objectives	- Examine the structure of a polynomial to identify the most appropriate factoring method - Factor more complex difference of perfect squares and perfect square trinomials - Factor polynomials completely - Apply factoring strategies to solve a real-world problem EXTENTION: - Factor polynomials with a binomial common factor. Ex: $x^2(2x + 1) - 4(2x + 1)$ - Factor the difference of perfect cubes	
Resources IMG 1227	Amsco: p.80 – 83, 85	eMath: unit #6 lesson #4 Engage NY: Mod #1 Lesson #13

- Lesson #3: Factoring by Grouping

Standards	A-REI.4.b	
Objectives	- Factoring four-term polynomials by identifying a common binomial factor(by grouping) - Factoring quadratic trinomials with a>1 by grouping	
Resources	Amsco: p.84, 88	eMath: unit #6 lesson #5 Engage NY: Mod #1 Lesson #12, 13

- Lesson #4: Equivalence of Expressions and Functions

Standards	MP 7. Look for and make use of structure. MP 1. Make sense of problems and persevere in solving them.	
Objectives	- Use polynomial identities to show that two expressions are equivalent - Use polynomial identities to prove that an equation is an identity	
Resources	Amsco: p.72-74	eMath: Unit #3 lesson #7 Engage NY: Mod 1 lesson #30

- Lesson #4: Quadratic Function Review (standard form, axis of symmetry, vertex, intercepts)

Standards	F-IF.4, F-IF.7.a	
Objectives	- Sketch parabola given its equation in a standard form - Find main characteristics of a parabola such as turning point (vertex), axis of symmetry, and x and y-intercepts - State domain and range of a given quadratic - Indicate the interval on which the function is positive or negative, increasing and decreasing	
Resources	Amsco:	eMath: unit #6 lesson #1 Engage NY:

- Lesson #5: Completing the Square and Shifting Parabolas (getting parabola to vertex form and analyzing the shift of a vertex)

Standards	F-IF.8.a, F-BF.3	
Objectives	- Rewrite quadratic equation from standard form to a vertex form - Given the vertex form of the equation state the turning point - Introduce transformation notation of a function af(x-h)+k and analyze the horizontal and vertical shift of a vertex of a parabola EXTENSION: - Compare completing a square method to other methods of solving quadratics	
Resources	Amsco: p.42-43	eMath: unit # 6 lesson #8 Engage NY: Mod #1 Lesson # 35

- Lesson #6: Intercept Form of Quadratic Function

Standards	F-IF.8.a, F-BF.3	
Objectives		
Resources	Amsco:	eMath:

- Lesson #7: Solving Quadratics Using Zero Product Rule

Standards	A.APR.B.3, F-IF.8.a	
Objectives	- Solving quadratics by factoring, including factoring by grouping - Writing equation of quadratic by identifying the roots from the graph and working backwards	
Resources	Amsco: p.89-91	eMath: unit #6 lesson #6 Engage NY:

- Lesson #8: Modeling with Quadratic Functions

Standards	F-IF.8.a, F-IF.9, F-IF.4, F-IF.5	
Objectives	- Real world application of quadratic function (finding maximum height, time an object lasts in the air, etc.) - Create a graph of a quadratic using appropriate scale related to a given word problem - Explain the meaning of x and y-intercepts in the context of the problem - Use graphing calculator	
Resources	Amsco: Big Ideas: Chapter 2.4	eMath: unit #6 lesson #9 Engage NY:

- Lesson #9: Systems Involving Lines, Circles, and Parabolas

Standards	A-REI.7	
Objectives	- Review of distance formula and general equation of a circle - Solving systems of linear-circular, circular-parabolic equations graphically - Solve algebraically and graphically a system of linear-quadratic equations	
Resources	Amsco: p.175-178	eMath: unit #6 lesson #10 Engage NY: Mod 1 lesson #31, 32

- Lesson #10: The Locus Definition of a Parabola

Standards	G-GPE.A.2, F-EF.8	
Objectives	- Define directrix and focus of a given parabola - Use analytic equation of a parabola $y = \frac{1}{4p}x^2$ or $x = \frac{1}{4p}y^2$ to determine if it opens up, down, left or right - Write an equation of a parabola centered at the origin and with a given focus - Identify vertex, focus, and directrix of a parabola given its equation - Create a sketch of a parabola given its equation in the above described forms - Write an equation of a parabola given directrix and focus	
Resources	Amsco: p. 118-125 Pearson: 622 - 625 Big Ideas: Chapter 2.3	eMath: unit #6 lesson #11 Engage NY: mod 1 lesson #33, 34 Pearson: p.622

- Lesson #11-12: Equation of Parabola with Vertex not at the Origin

Standards	G-GPE.A.2
Objectives	- Represent vertical and horizontal shifts of a parabola with an appropriate analytic equation in the form of $(x - h)^2 = 4p(y - k), (y - k)^2 = 4p(x - h)$ - Find the vertex, focus, and directrix of a given parabola in the above mentioned form - Match equation of the parabola in analytic form with its corresponding graph - Find vertex of a parabola given its analytic equation

Resources	Amsco: p. 118-125 Pearson: 626-629 Assessment Readiness: p.101 -102	eMath: unit #6 lesson #11 Engage NY: mod 1 lesson #33, 34 Pearson: p.626

- Lesson #13: Writing Equation of Parabola Using Locus Definition

Standards	G-GPE.A.2	
Objectives	- Write an equation of a parabola with given vertex and focus - Write an equation of a parabola with given vertex and directrix - Write equation of a directrix given focus and vertex - Find the equation of the set of points which are equidistant from a given point and a directrix (example: point (4, -2) and the line y =4) . Sketch this set of points EXTENSION: - Write an analytic equation of a parabola given its graph	
Resources	Amsco: p. 118-125	eMath: unit #6 lesson #11 Engage NY: mod 1 lesson #33, 34

Unit #4: Complex Numbers

- Lesson #1: Imaginary Number

Standards	N-CN.A.1, N-CN.A.2, N-CN.C.7, MP 8. Look for and express regularity in repeated reasoning.	
Objectives	- State the definition of the imaginary unit *i* and pure imaginary numbers - Simplifying radicals with the negative radicands - Solve incomplete quadratics which lead to imaginary roots - Simplifying powers of i	
Resources	Amsco: p.103-105	eMath: unit #9 lesson #1 Engage NY: Mod #1 Lesson #37

- Lesson #2: Operations on Complex Numbers

Standards	N-CN.A.1, N-CN.A.2, N-CN.A.4, N-CN.C.7	
Objectives	- Adding and subtracting complex numbers - Finding conjugates of complex numbers - Multiplying complex numbers Extension: Graph complex numbers on a complex plane	
Resources	Amsco: p. 103-105	eMath: unit #9 lesson #2 Engage NY: Mod #1 Lesson #38

- Lesson #3: Solving Quadratic Equations with Complex Solutions

Standards	N-CN.C.7, A-REI.B.4b	
Objectives	- Solve quadratic equations with complex roots using quadratic formula and square root method - Rewrite quadratic equation in a factored form using its real and complex roots - Counting multiplicities –quadratics having two roots in the complex numbers system	
Resources	Amsco: p. 108-113	eMath: unit # 9 lesson #3 Engage NY:

- Lesson #4: The Discriminant and the Nature of the Roots

Standards	N-CN.C.7, A-REI.B.4b, A-APR.3, F-IF.8a MP 3 Construct viable argument and critique the reasoning of others, MP 7 Look for and make use of structure
Objectives	- define and determine the value of the discriminant - determine the nature of the roots using the discriminant - Describe how finding discriminant relates to finding x-intercept of a parabola - Construct viable argument and critique the reasoning of others

Resources	Amsco: p. 108 - 113	eMath: unit #9 lesson #4
		Engage NY: Mod #1 Lesson #39

Unit #5: Polynomial Functions and their Algebra

- Lesson #1: Long Division of Polynomials

Standards	A-APR.B.2, A-APR.6, A-APR.7, MP 6 Attend to precision	
Objectives	- Divide different degree polynomials by a binomial using long division - Insert terms with zero as a coefficient for "missing powers" - Using long division determine if a given binomial is a factor of a given polynomial	
Resources	Amsco: p.138 – 141, Pearson: 304-306	eMath: Unit #10 Lesson #10
	Big Ideas: Chapter 4.3	Engage NY: Mod #1 Lesson #18

- Lesson #2: Synthetic Division of Polynomials

Standards		
Objectives	Dividing polynomials applying the method of synthetic division	
Resources	Amsco: p.142 – 143	eMath:
	Big Ideas: Chapter 4.3	Engage NY:

- Lesson #3: Remainder and Factor Theorem

Standards	A-APR.D.6, A-APR.B.2	
Objectives	- Evaluating polynomial by the Remainder Theorem - Determine if a given polynomial is divisible by a given binomial factor (The Factor Theorem) - Show how the Remainder theorem can help determine if a given number is the root of the polynomial. (NOTE: If r is a root of a polynomial then $x - r$ is a factor of a polynomial	
Resources	Amsco: 147 - 151	eMath: Unit #10 Lesson #11
		Engage NY: Mod #1 Lesson #18, 19. See Lesson #20-21 for application of the Rem. Theorem

- Lesson #4 - 5: Finding Roots of Higher Degree Polynomial Equations

Standards	A.APR.B.3, N-CN.C.7, F-IF.7.C MP 6 Attend to precision, MP7 Look for and make sense of structure	
Objectives	- Test if a given number is the solution of a higher degree polynomial equation using the Remainder Theorem - using Fundamental Theorem of Algebra state the number of zeros of a polynomial function - solve a polynomial equation of 3rd degree given one of the factors and by applying synthetic division to find the remaining factors - State the multiplicity of roots of a polynomial function - Solve high order polynomials by factoring completely where some of the factors are complex numbers (Example: $x^4 -3x^2 – 4 =0$ as $(x + i)(x – i)(x + 2)(x – 2)$) Next lesson - State the difference between the solution(s) of the equation and x-intercepts (solutions	

	may include complex numbers, x-intercepts are real solutions of the equation) • Construct a polynomial function in a factored form that has a specified set of zeros with stated multiplicity (including complex factors) EXTENSION: Descartes' Rule of signs	
Resources	Amsco: p.152-154, 160-161 Pearson: 288-293, 296 Decart's rule 165-167	eMath: unit # 10 lesson # See Engage NY: Mod #1 Lesson #11, 39

Lesson 5:
- Classify polynomials by degree
- Give an example of a quadratic equation with two distinct real solutions, one real solution, or two complex solutions
- Factor polynomial of the form (x^2 + a) as *(x + ai)(x- ai)*
   (Example: x^2 + 9 = (x + 3i)(x -3i)
- Determine if a complex number is a solution to a given quadratic

- Lesson #6: Graphs and Zeros of a Polynomial Function.

Standards	F-IF.7.c, N-CN.9, A-APR.3 MP 5 Use appropriate tools strategically, MP 3 Construct a viable argument to critique the reason of others, MP 7 Look for and make use of structure	
Objectives	• Determine the number of real zeros, complex zeros, given the graph of a function and its equation • Determine the degree of a polynomial function given its graph • Create a sketch of higher degree polynomial function utilizing graphing calculator • Critique reasoning of others EXTANSION: determine degree of a polynomial by finding consecutive differences	
Resources	Amsco: p.154-164 Pearson: 280-287	eMath: unit # 10 lesson #2,3 See Engage NY: Mod #1 Lesson #14, 40

- Lesson #7: Even and Odd Degree Functions

Standards		
Objectives	• State characteristics of odd and even degree functions • Identify the type of a given function based on a graph • Investigate graphs of polynomial functions (the number of relative minima and maxima, increasing and decreasing intervals) • Sketch polynomial functions using its properties	
Resources	Amsco: p.52	eMath: Unit #7 Lesson #5 See Engage NY: Mod #1 Lesson #15

- Lesson #8: Structure in Graphs of Polynomial Functions

Standards		
Objectives	• Determine end behavior of polynomial functions by looking at the leading coefficient • Match graphs of polynomial functions with their corresponding equations • Find a polynomial function given its zeros or given its graph • Use factored form of a polynomial function <u>to sketch</u> the components of its graph between zeros EXTENSION: Real word application of polynomial function (create appropriate graphical representation)	

Resources	Amsco: p.159-164, Pearson 325	eMath: unit # lesson #
		See Engage NY:

Unit #6: Rational Expressions and Equations

- Lesson #1: Simplifying Rational Expressions

Standards	A-APR.C.6, A-REI.A.2	
Objectives	- State which values will make the rational expression undefined - State the domain of a rational function - Reduce rational expressions to lowest terms - Determine if the given two rational expressions are equivalent	
Resources	Amsco: p. 185-187 Pearson: 527, 531	eMath: Unit #10 Lesson #6
		See Engage NY: Mod #1 Lesson #22,23

- Lesson #2: Multiplying and Dividing Rational Expressions

Standards	Practice MP.7, A-APR.D.6	
Objectives	- Multiply and divide rational expressions and express them in a simplest form - Simplify complex fractions by the process of dividing one rational expression by another	
Resources	Amsco: p.187 – 192 Pearson: 528-533	eMath: Unit #10 Lesson #7
		See Engage NY: Mod #1 Lesson #24

- Lesson #3: Adding and Subtracting Rational Expressions

Standards	Practice MP.7, A-APR.C.6	
Objectives	- Find a common multiple of the denominators to use as a common denominator - Find equivalent rational expressions for each expressions using the common denominator - Complete multistep problem involving adding, subtracting , multiplying, and dividing rational expressions	
Resources	Amsco: p. 192 – 197 Pearson: 534 - 540	eMath: Unit #10 Lesson #8
		See Engage NY: Mod #1 Lesson #

- Lesson #4: Complex Fractions

Standards		
Objectives	Simplify complex fractions by the process of dividing one rational expression by another	
Resources	Amsco: p.190, 192	eMath: Unit #10 Lesson #9
		See Engage NY: Mod #1 Lesson #

- Lesson #5: Solving Rational Equations

Standards	A-REI.A.2, F-BF.B.4a, Practice MP.7	
Objectives	- Solve rational equations by cross-multiplying or multiplying each term by a common denominator - Check for extraneous solutions EXTENSION: word problems leading to rational equations (see Engage NY Mod #1 Lesson #27)	
Resources	Amsco: p.197 – 204 Pearson: 542 - 547	eMath: Unit #10 Lesson #12
		See Engage NY: Mod #1 Lesson #26

- Lesson #6: Solving word problems leading to rational equations

Unit #7: Powers and Radicals

- Lesson #1: Review of Integer Exponents

Standards	
Objectives	- Use appropriate laws of exponents to simplify expressions with positive, negative, and zero exponents - Rewrite expressions using only positive exponents
Resources	Amsco: Pearson: 360	eMath: Unit #8 Lesson #3, Unit #4 Lesson #1 See Engage NY: Mod #1 Lesson #

- Lesson #2: Fractional Exponents

Standards	N-RN.A.1	
Objectives	- Simplify expressions including rational exponents - Multiply and divide expressions with rational exponents EXTENSION: Irrational Exponents ($2^{\sqrt{2}}, 2^{\pi}$)	
Resources	Amsco: p.241 Pearson: 381-387	eMath: Unit #4 Lesson #2 , Unit #8 Lesson #5 See Engage NY: Mod #1 Lesson #9

- Lesson #3: Properties of Exponents and Radicals

Standards	N-RN.A.2	
Objectives	- Rewrite expressions involving radicals in terms of rational exponents using the properties of exponents - Simplify more complex expressions with radicals	
Resources	Amsco: p.241 – 244, Pearson:363 -380	eMath: See Engage NY: Mod #1 Lesson #9

- Lesson #4: Simplifying Radical Expressions

Standards		
Objectives	- Simplify square roots and cubed roots with variables and exponents as radicands (including negative radicands) - Rationalize the denominator in a given expression - Adding, multiplying, dividing radicals	
Resources	Amsco: p.224 – 230, 237 -238 Pearson: 363 - 380	eMath: See Engage NY: Mod #1 Lesson #9,28

- Lesson #5: Solving Square Root Equations

Standards		
Objectives	- Solve radical equations and check for extraneous roots - Justify the steps in solving radical equations - Solving radical equations by moving one of the radicals to the opposite side of the equation and squaring both sides of the equation ($\sqrt{x-3} + \sqrt{x+4} = 4$ and variations of it) - Identify radical equations that do not have a solution	
Resources	Amsco: p.245 – 250 Pearson: 390-396	eMath: Unit #8 Lesson #2 See Engage NY: Mod #1 Lesson #28,29

- Lesson #6: Solving Cube Root, Forth Root Equations, and Equations with Fractional Exponents

Standards	
Objectives	- Solve radical equations with higher index value by raising both sides of the equation to an appropriate power - Solve equations with fractional exponents
Resources	Amsco: p.249, 257	eMath: Unit #4 Lesson #2 See Engage NY: Mod #1 Lesson #

- Lesson #7: Graphing Square Root and Cube Root Functions (using calculator, and stating domain, range and translations)

Standards	
Objectives	- Graph square root and cube root functions using calculator - Describe the characteristics of the above functions (domain, range, intervals of increase and decrease, end behavior) - Sketch vertical and horizontal translations of the above functions
Resources	Amsco: p.251 – 255 Pearson: 414-420	eMath: Unit #8 Lesson #1 See Engage NY: Mod #1 Lesson #

Unit #8: Sequences and Series

- Lesson #1 - 2: Review of Geometric and Arithmetic Sequences

Standards	F-BF.1.A	
Objectives	- Determine if a given sequence is arithmetic or geometric - Write explicit equations of a given geometric ($a_n = a_1 r^{n-1}$) or arithmetic sequence ($a_n = a_1 + (n-1)d$) - Compare and contrast the explicit formula of two sequences - Find the nth term of an arithmetic or geometric sequence	
Resources	Amsco: Pearson: 574-586 Big Ideas: Chapter 8.1, 8.2	eMath: Unit # Lesson # See Engage NY: Mod #1 Lesson #

- Lesson #3: Explicit and Recursive Formula for Geometric and Algebraic Sequences

Standards	F-BF.2, F-EF.8	
Objectives	- Write a recursive rule for given sequence of numbers (arithmetic and geometric) - Apply recursive definition of arithmetic or geometric sequences to find several terms of a given sequence - Translate a recursive rule into explicit equation and vice versa	
Resources	Amsco: Pearson: 567-571 Big Ideas: Chapter 8.5	eMath: See Engage NY: Mod #1 Lesson #

- Lesson #4: Arithmetic and Geometric Series and Sigma Notation

Standards	F-BF.2, F-EF.8	
Objectives	- Compare and contrast sequences and series - State the formula of a sum of Arithmetic and Geometric Series - Find the sum of the first n terms of a given series - Find sums using Sigma notation	
Resources	Amsco: Pearson: 588-600	eMath:

| | Big Ideas: Chapter 8.3, 8.4 | See Engage NY: Mod #1 Lesson # |

- Lesson #5: Geometric Series Application

Standards	F-LE.A.2, F-BF.1.A, F-BF.2	
Objectives	- Write an explicit rule for the geometric sequence that models a real life problem and solve the problem - Given table of values that represents money earning scenario determine the rule needed to find money saved in 'n' weeks - Match recursive definition of geometric series with a real life scenario	
Resources	Amsco: See IMG	eMath: See Engage NY: Mod #1 Lesson #

SEE NEXT PAGE for MRS22 Overview

Unit #9: Exponential and Logarithmic Functions
- Lesson #1: Exponential Functions Basics (general form, determine if it is a growth or decay model based on a given equation or a graph)
- Lesson #2: Finding Equations of Exponential Functions (from a table or a graph, or coordinates of two points)
- Lesson #3: Solving Exponential Equations by Finding a Common Base
- Lesson #4: Modeling with Exponential Growth and Decay
- Lesson #5: Introduction to Logarithms
- Lesson #6: Graphs of Logarithmic Functions (including inverse relation between logarithmic and exponential functions)
- Lesson #7: Laws of Logarithms (possibly 2 days)
- Lesson #8: Natural and Base-10 Logarithms
- Lesson #9: Solving Logarithmic Equations
- Lesson #10: Solving Exponential Equations Using Logarithms
- Lesson #11: Compound Interest Problems

.

.

Unit #8	Sequences and Series
Total: 5 days	- Lesson #1 - 2: Review of Geometric and Algebraic Sequences - Lesson #3: Explicit and Recursive Formula for Geometric and Algebraic Sequences - Lesson #4: Arithmetic and Geometric Series and Sigma Notation - Lesson #5: Geometric Series Application !!! NOTE: heavy emphasis on recursive definition of geometric sequence in the contex of word problem. More days might be needed.

Unit #10: Transformations of Functions
- Lesson #1: Shifting and Reflecting Functions (quadratic, exponential, square root functions, reference to notation af(x – h) +k)
- Lesson #2: Key features of Different types of functions (domain, range, end behavior, increase/decrease, roots)
- Lesson #3: Rate of Change of Quadratic and Exponential Functions

Unit #11: Circular Functions – Trigonometry
Consider starting with periodic functions intro Pearson: 828-834
- Lesson #1: Rotations and Angle Terminology
- Lesson #2: Radian Angle Measurement
- Lesson #3: The Unit Circle
- Lesson #4: The Definition of the Sine and Cosine Functions
- Lesson #5: Basic Graphs of Sine and Cosine
- Lesson #6: Vertical and Horizontal Shifting of Sinusoidal Graphs
- Lesson #7: The Frequency and Period of a Sinusoidal Graph
- Lesson #8: More Work with the Sine and Cosine Functions (trig identities)
- NOTE: ???? Can't find trig equations in the standards
- Lesson #9: Sinusoidal Modeling
- Lesson #10: The Tangent Function
- Lesson #11: The Reciprocal Function Pearson:833-890

Unit #12: Probability
- Lesson #1: Introduction to Probability
- Lesson #2: Sets and Probability

- Lesson #3: Adding Probabilities
- Lesson #4: Conditional Probability
- Lesson #5: Independent and Dependent Events
- Lesson #6: Multiplying Probabilities

Unit #13: Statistics
- Lesson #1: Variability and Sampling
- Lesson #2: Population Parameters
- Lesson #3 – The Normal Distributions
- Lesson #4 – The Normal Distribution and Z-Scores
- Lesson #5 – Sample Means
- Lesson #6 – Sample Proportions
- Lesson #7 – The Difference in Samples Means
- Lesson #8 – Linear Regression and Lines of Best Fit
- Lesson #9 – Other Types of Regression