

ABSS Math Unit Planning Template

Introduction:

Grade/Course: 9_12 Adv Functions and Modeling		Suggested Unit Pacing (# of days): 8	
Unit Number and Title: Unit 4 - Polynomial and Rational Functions		Mathematical Practices	
		P1	Make sense of problems and persevere in solving them.
Conceptual Overview This unit allows for the examination of locating zeros of a polynomial function and solving for roots of an equation. modeling of real-world problems is extended through the material.		P2	Reason abstractly and quantitatively.
		P3	Construct viable arguments and critique the reasoning of others.
		P4	Model with mathematics.
		P5	Use appropriate tools strategically.
		P6	Attend to precision.
		P7	Look for and make use of structure.
		P8	Look for and express regularity in repeated reasoning.
Essential Understandings			
CCSS		<u>CCSS.9 12.MA.AL.A.APR</u>	Arithmetic with Polynomials and Rational Expressions
CCSS	Interpret the structure of expressions	<u>CCSS.9 12.MA.AL.A.SSE.1.a</u>	Interpret parts of an expression, such as terms, factors, and coefficients.
CCSS	Seeing Structure in Expressions	<u>CCSS.9 12.MA.AL.A.SSE.2</u>	Use the structure of an expression to identify ways to rewrite it. <i>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 $(x^2 - y^2)(x^2 + y^2)$.</i>
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.1</u>	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.CL1</u>	Perform arithmetic operations on polynomials
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.CL2</u>	Understand the relationship between zeros and factors of polynomials
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.2</u>	Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a , the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.3</u>	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
CCSS	Arithmetic with Polynomials	<u>CCSS.9 12.MA.AL.A.APR.CL3</u>	Use polynomial identities to solve problems

	and Rational Expressions		
CCSS	Arithmetic with Polynomials and Rational Expressions	<u>CCSS.9 12.MA.AL.A.APR.5</u>	(+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n , where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
CCSS		<u>CCSS.9 12.MA.F.IF</u>	Interpreting Functions
CCSS	Interpreting Functions	<u>CCSS.9 12.MA.F.IF.CL1</u>	Understand the concept of a function and use function notation
CCSS	Analyze functions using different representations	<u>CCSS.9 12.MA.F.IF.7.a</u>	Graph linear and quadratic functions and show intercepts, maxima, and minima.
CCSS	Analyze functions using different representations	<u>CCSS.9 12.MA.F.IF.7.b</u>	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
CCSS	Analyze functions using different representations	<u>CCSS.9 12.MA.F.IF.7.c</u>	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
CCSS	Analyze functions using different representations	<u>CCSS.9 12.MA.F.IF.7.d</u>	(+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
CCSS	Interpreting Functions	<u>CCSS.9 12.MA.F.IF.8</u>	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
CCSS	Analyze functions using different representations	<u>CCSS.9 12.MA.F.IF.8.a</u>	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
CCSS	Linear, Quadratic, and Exponential Models★	<u>CCSS.9 12.MA.F.LE.3</u>	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
CCSS	The Real Number System	<u>CCSS.9 12.MA.N.RN.2</u>	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
CCSS	The Real Number System	<u>CCSS.9 12.MA.N.RN.CL2</u>	Use properties of rational and irrational numbers.
CCSS		<u>CCSS.9 12.MA.N.CN</u>	The Complex Number System
CCSS	The Complex Number System	<u>CCSS.9 12.MA.N.CN.CL1</u>	Perform arithmetic operations with complex numbers.
CCSS	The Complex Number System	<u>CCSS.9 12.MA.N.CN.1</u>	Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
CCSS	The Complex Number System	<u>CCSS.9 12.MA.N.CN.2</u>	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
CCSS	The Complex Number	<u>CCSS.9 12.MA.N.CN.3</u>	(+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex

	System		numbers.	
CCSS	The Complex Number System	<u>CCSS.9 12.MA.N.CN.9</u>	(+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	
CCSS	The Complex Number System	<u>CCSS.9 12.MA.N.CN.8</u>	(+) Extend polynomial identities to the complex numbers. <i>For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.</i>	
Learning Targets	<ul style="list-style-type: none"> • Determine Roots of Polynomial Equations • Solve Quadratic, Rational, and Radical Equations and Rational and Radical Inequalities • Find Factors of Polynomials • Approximate Real Zeros of Polynomial Functions • Write and Interpret Polynomial Functions that Model Real-World Data 			
Essential Terminology	<ul style="list-style-type: none"> • completing the square • complex number • conjugate • degree • Descartes' Rule of Signs • discriminant • extraneous solution • Factor Theorem • Fundamental Theorem of Algebra • imaginary number • Lower Bound Theorem • Upper Bound Theorem • polynomial equation • polynomial function • Quadratic Formula • radical equation • rational equation • Remainder Theorem • root • synthetic division • long division • leading coefficient • zero 			
Literacy Integration	Literacy Standards	Level	Standard	Standard Name
	Literature Connections			
Technology Integration	Technology Standards	Level	Standard	Standard Name
	Websites			
Assessment	Formative			
	Performance Tasks			
	Summative			
Resources				
Learning Plan	Instructional Sequence	<ul style="list-style-type: none"> • Polynomial Functions (4-1) • Quadratic Equations (4-2) • The Remainder and Factor Theorems (4-3) • The Rational Root Theorem (4-4) • Locating Zeros of a Polynomial Function (4-5) • Rational Equations and Partial Fractions (4-6) • Radical Equations and Inequalities (4-7) • Modeling Real-World Data with Polynomial Functions (4.8) • Review • Assessment 		
Differentiation	Remediation			
	Enrichment			