



Alignment Document
State of New York and Aventa Learning Algebra II

Algebra II
2005-2007 Benchmark Blueprint

Strand	Goals	Bands	Standards	Unit Name	Course Topic Description
A2.PS Problem Solving	Students will build new mathematical knowledge through problem solving.		A2.PS.1 Use a variety of problem solving strategies to understand new mathematical content	Covered throughout the course	
			A2.PS.2 Recognize and understand equivalent representations of a problem situation or a mathematical concept		
	Students will solve problems that arise in mathematics and in other contexts.		A2.PS.3 Observe and explain patterns to formulate generalizations and conjectures		
			A2.PS.4 Use multiple representations to represent and explain problem situations (e.g., verbally, numerically, algebraically, graphically)		
	Students will apply and adapt a variety of appropriate strategies to solve problems.		A2.PS.5 Choose an effective approach to solve a problem from a variety of strategies (numeric, graphic, algebraic)		
			A2.PS.6 Use a variety of strategies to extend solution methods to other problems		
			A2.PS.7 Work in collaboration with others to propose, critique, evaluate, and value alternative approaches to problem solving	Covered throughout the course	
	Students will monitor and reflect on the process of mathematical		A2.PS.8 Determine information required to solve the problem, choose methods	Covered throughout the	

	problem solving.		for obtaining the information, and define parameters for acceptable solutions	course	
			A2.PS.9 Interpret solutions within the given constraints of a problem		
			A2.PS.10 Evaluate the relative efficiency of different representations and solution methods of a problem		
A2.RP Reasoning and Proof	Students will recognize reasoning and proof as fundamental aspects of mathematics.		A2.RP.1 Support mathematical ideas using a variety of strategies		
	Students will make and investigate mathematical conjectures.		A2.RP.2 Investigate and evaluate conjectures in mathematical terms, using mathematical strategies to reach a conclusion		
			A2.RP.3 Evaluate conjectures and recognize when an estimate or approximation is more appropriate than an exact answer		
			A2.RP.4 Recognize when an approximation is more appropriate than an exact answer		
	Students will develop and evaluate mathematical arguments and proofs.		A2.RP.5 Develop, verify, and explain an argument, using appropriate mathematical ideas and language		
			A2.RP.6 Construct logical arguments that verify claims or counterexamples that refute claims		
			A2.RP.7 Present correct mathematical arguments in a variety of forms		
			A2.RP.8 Evaluate written arguments for validity		
	Students will select and use various types of reasoning and methods of proof.		A2.RP.9 Support an argument by using a systematic approach to test more than one case		
			A2.RP.10 Devise ways to verify results, using counterexamples and informal		

			indirect proof		
			A2.RP.11 Extend specific results to more general cases		
			A2.RP.12 Apply inductive reasoning in making and supporting mathematical conjectures		
A2.CM Communication	Students will organize and consolidate their mathematical thinking through communication.		A2.CM.1 Communicate verbally and in writing a correct, complete, coherent, and clear design (outline) and explanation for the steps used in solving a problem		
			A2.CM.2 Use mathematical representations to communicate with appropriate accuracy, including numerical tables, formulas, functions, equations, charts, graphs, and diagrams		
	Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.		A2.CM.3 Present organized mathematical ideas with the use of appropriate standard notations, including the use of symbols and other representations when sharing an idea in verbal and written form		
			A2.CM.4 Explain relationships among different representations of a problem		
			A2.CM.5 Communicate logical arguments clearly, showing why a result makes sense and why the reasoning is valid	Covered throughout the course	
			A2.CM.6 Support or reject arguments or questions raised by others about the correctness of mathematical work		
	Students will analyze and evaluate the mathematical thinking and strategies of others.		A2.CM.7 Read and listen for logical understanding of mathematical thinking shared by other students		
			A2.CM.8 Reflect on strategies of others in relation to one's own strategy		

			A2.CM.9 Formulate mathematical questions that elicit, extend, or challenge strategies, solutions, and/or conjectures of others		
	Students will use the language of mathematics to express mathematical ideas precisely.		A2.CM.10 Use correct mathematical language in developing mathematical questions that elicit, extend, or challenge other students' conjectures		
			A2.CM.11 Represent word problems using standard mathematical notation	Covered throughout the course	
			A2.CM.12 Understand and use appropriate language, representations, and terminology when describing objects, relationships, mathematical solutions, and rationale	Covered throughout the course	
			A2.CM.13 Draw conclusions about mathematical ideas through decoding, comprehension, and interpretation of mathematical visuals, symbols, and technical writing		
A2.CN Connections	Students will recognize and use connections among mathematical ideas		A2.CN.1 Understand and make connections among multiple representations of the same mathematical idea		
			A2.CN.2 Understand the corresponding procedures for similar problems or mathematical concepts		
	Students will understand how mathematical ideas interconnect and build on one another to produce a coherent whole.		A2.CN.3 Model situations mathematically, using representations to draw conclusions and formulate new situations		
			A2.CN.4 Understand how concepts, procedures, and mathematical results in one area of mathematics can be used to solve problems in other areas of		

			<p>mathematics</p> <p>A2.CN.5 Understand how quantitative models connect to various physical models and representations</p>		
	Students will recognize and apply mathematics in contexts outside of mathematics.		<p>A2.CN.6 Recognize and apply mathematics to situations in the outside world</p> <p>A2.CN.7 Recognize and apply mathematical ideas to problem situations that develop outside of mathematics</p> <p>A2.CN.8 Develop an appreciation for the historical development of mathematics</p>		
A2.R Representation	Students will create and use representations to organize, record, and communicate mathematical ideas.		<p>A2.R.1 Use physical objects, diagrams, charts, tables, graphs, symbols, equations, or objects created using technology as representations of mathematical concepts</p> <p>A2.R.2 Recognize, compare, and use an array of representational forms</p> <p>A2.R.3 Use representation as a tool for exploring and understanding mathematical ideas</p>		
			<p>A2.R.4 Select appropriate representations to solve problem situations</p> <p>A2.R.5 Investigate relationships among different representations and their impact on a given problem</p>	Covered throughout the course	
			<p>A2.R.6 Use mathematics to show and understand physical phenomena (e.g., investigate sound waves using the sine and cosine functions)</p> <p>A2.R.7 Use mathematics to show and understand social phenomena (e.g., interpret the results of an opinion poll)</p>		
	Students will select, apply, and translate among mathematical representations to solve problems.				
	Students will use representations to model and interpret physical, social, and mathematical phenomena.				

			A2.R.8 Use mathematics to show and understand mathematical phenomena (e.g., use random number generator to simulate a coin toss)		
A2.N Number Sense and Operations	Students will understand meanings of operations and procedures, and how they relate to one another.	Operations	A2.N.1 Evaluate numerical expressions with negative and/or fractional exponents, without the aid of a calculator (when the answers are rational numbers)		
			A2.N.2 Perform arithmetic operations (addition, subtraction, multiplication, division) with expressions containing irrational numbers in radical form	Complex Numbers	Introduction
			A2.N.3 Perform arithmetic operations with polynomial expressions containing rational coefficients	Polynomials	Combining polynomials
			A2.N.4 Perform arithmetic operations on irrational expressions		
			A2.N.5 Rationalize a denominator containing a radical expression		
			A2.N.6 Write square roots of negative numbers in terms of i	Complex Numbers	The complex number i
			A2.N.7 Simplify powers of i		
			A2.N.8 Determine the conjugate of a complex number		
			A2.N.9 Perform arithmetic operations on complex numbers and write the answer in the form $a + bi$ Note: This includes simplifying expressions with complex denominators.	Complex Numbers	Absolute Value of a Complex Number
				Complex Numbers	Addition and Subtraction in a Complex Plane
	Complex Numbers	Working with complex numbers			
A2.N.10 Know and apply sigma notation					
A2.A Algebra	Students will represent and analyze algebraically a wide	Equations and Inequalities	A2.A.1 Solve absolute value equations and inequalities involving linear	Absolute Value	Absolute Value and Inequalities

variety of problem solving situations.		expressions in one variable	Absolute Value	More Complicated Absolute Value Equations
			Absolute Value	Absolute Value equations in other places
			Absolute Value	Absolute Value and Inequalities Shortcuts
			Absolute Value	Shortcuts
			Absolute Value	Absolute Value and Inequalities Shortcuts Summary
			Absolute Value	Absolute Value Equations
		A2.A.2 Use the discriminant to determine the nature of the roots of a quadratic equation	Quadratics	The Discriminant of a Quadratic
		A2.A.3 Solve systems of equations involving one linear equation and one quadratic equation algebraically Note: This includes rational equations that result in linear equations with extraneous roots.		
		A2.A.4 Solve quadratic inequalities in one and two variables, algebraically and graphically	Absolute Value Absolute Value	Absolute Value and Inequalities Shortcuts Summary Absolute Value and Inequalities
		A2.A.5 Use direct and inverse variation to solve for unknown values		
A2.A.6 Solve an application which results in an exponential function	Exponential and Logarithm functions Exponential and Logarithm	Computations with exponential functions Exponential functions: an example		

				functions	
				Exponential and Logarithm functions	Graphs of exponential functions
				Exponential and Logarithm functions	Exponential functions: the formal definition
				Exponential and Logarithm functions	Introduction
				Exponential and Logarithm functions	Exponential functions: an intuitive approach
Students will perform algebraic procedures accurately.	Variables and Expressions	A2.A.7 Factor polynomial expressions completely, using any combination of the following techniques: common factor extraction, difference of two perfect squares, quadratic trinomials	Polynomials	The Factor Theorem	
			Polynomials	Working with Cubes	
			Polynomials	Factoring Polynomials	
		A2.A.8 Apply the rules of exponents to simplify expressions involving negative and/or fractional exponents			
		A2.A.9 Rewrite algebraic expressions that contain negative exponents using only positive exponents			
		A2.A.10 Rewrite algebraic expressions with fractional exponents as radical expressions			
		A2.A.11 Rewrite algebraic expressions in radical form as expressions with fractional exponents			
		A2.A.12 Evaluate exponential expressions, including those with base e			

		A2.A.13 Simplify radical expressions		
		A2.A.14 Perform addition, subtraction, multiplication and division of radical expressions		
		A2.A.15 Rationalize denominators involving algebraic radical expressions		
		A2.A.16 Perform arithmetic operations with rational expressions and rename to lowest terms		
		A2.A.17 Simplify complex fractional expressions		
		A2.A.18 Evaluate logarithmic expressions in any base	Exponential and Logarithm functions	Values of logarithm functions
			Exponential and Logarithm functions	Real Life Logarithmic Examples
			Exponential and Logarithm functions	Logarithm functions
			Exponential and Logarithm functions	More Real Life Logarithmic Examples
			Exponential and Logarithm functions	Logarithm functions and exponential functions together
			Exponential and Logarithm functions	Values of logarithm functions: a look at your calculator
		A2.A.19 Apply the properties of logarithms to rewrite logarithmic	Exponential and Logarithm	Computations with logarithm functions

			expressions in equivalent forms	functions	
				Exponential and Logarithm functions	Properties of Logarithms
				Exponential and Logarithm functions	Comparing sizes
				Exponential and Logarithm functions	Logarithm functions and exponential functions together
		Equations and Inequalities	A2.A.20 Determine the sum and product of the roots of a quadratic equation by examining its coefficients		
			A2.A.21 Determine the quadratic equation, given the sum and product of its roots		
			A2.A.22 Solve radical equations		
			A2.A.23 Solve rational equations and inequalities	Absolute Value	Absolute Value and Inequalities
				Absolute Value	Absolute Value and Inequalities Shortcuts Summary
			A2.A.24 Know and apply the technique of completing the square	Quadratics	Completing the Square
			A2.A.25 Solve quadratic equations, using the quadratic formula	Quadratics	Developing the Quadratic Formula
				Quadratics	The Quadratic Formula
		A2.A.26 Find the solution to polynomial equations of higher degree that can be solved using factoring and/or the quadratic formula	Quadratics	The Quadratic Formula	
			Quadratics	Developing the Quadratic Formula	
			Polynomials	Factoring Polynomials	

				Polynomials	Working with Cubes
				Polynomials	The Factor Theorem
			A2.A.27 Solve exponential equations with and without common bases		
			A2.A.28 Solve a logarithmic equation by rewriting as an exponential equation	Exponential and Logarithm functions	The horizontal line property, and one-to-one functions
				Exponential and Logarithm functions	Graphs of logarithm functions
	Students will recognize, use, and represent algebraically patterns, relations, and functions.	Patterns, Relations, and Functions	A2.A.29 Identify an arithmetic or geometric sequence and find the formula for its nth term	Sequences and Series	Geometric Series
				Sequences and Series	Summation notation (also called Sigma notation)
				Sequences and Series	One very special Arithmetic Series
				Sequences and Series	Series: An important example
				Sequences and Series	Arithmetic sequences
				Sequences and Series	Arithmetic Series
				Sequences and Series	Series
				Sequences and Series	Sigma notation and series

				Sequences and Series	Geometric sequences
			A2.A.30 Determine the common difference in an arithmetic sequence	Sequences and Series	Series
				Sequences and Series	One very special Arithmetic Series
				Sequences and Series	Summation notation (also called Sigma notation)
				Sequences and Series	Sigma notation and series
				Sequences and Series	Arithmetic sequences
				Sequences and Series	Arithmetic Series
				Sequences and Series	Series: An important example
			A2.A.31 Determine the common ratio in a geometric sequence	Sequences and Series	Geometric Series
				Sequences and Series	Summation notation (also called Sigma notation)
				Sequences and Series	Sigma notation and series
				Sequences and Series	Series: An important example
				Sequences and Series	Series

				Sequences and Series	Geometric sequences
			A2.A.32 Determine a specified term of an arithmetic or geometric sequence	Sequences and Series	Arithmetic Series
				Sequences and Series	Summation notation (also called Sigma notation)
				Sequences and Series	Sigma notation and series
				Sequences and Series	Series: An important example
				Sequences and Series	Series
				Sequences and Series	Geometric sequences
				Sequences and Series	Geometric Series
				Sequences and Series	One very special Arithmetic Series
				Sequences and Series	Arithmetic sequences
			A2.A.33 Specify terms of a sequence, given its recursive definition		
			A2.A.34 Represent the sum of a series, using sigma notation		
			A2.A.35 Determine the sum of the first n terms of an arithmetic or geometric series	Sequences and Series	Geometric Series
				Sequences and Series	Arithmetic Series

				Series	
			A2.A.36 Apply the binomial theorem to expand a binomial and determine a specific term of a binomial expansion	Counting	More about the Binomial Theorem
				Counting	Some computations with factorials
				Counting	The values in Pascal's triangle as factorials
				Counting	The Binomial Theorem
			A2.A.37 Define a relation and function	Composition of Functions	Function Notation
				Composition of Functions	Definition of Functions
				Composition of Functions	Review of Functions
				Composition of Functions	Horizontal Line Test
			A2.A.38 Determine when a relation is a function	Composition of Functions	Review of Functions
				Composition of Functions	Horizontal Line Test
				Composition of Functions	Definition of Functions
			A2.A.39 Determine the domain and range of a function from its equation	Composition of Functions	Domain Restrictions
			A2.A.40 Write functions in functional notation	Composition of Functions	Checking that two functions really are inverse functions of each other

				Composition of Functions	Function Notation
			A2.A.41 Use functional notation to evaluate functions for given values in the domain	Composition of Functions	Checking that two functions really are inverse functions of each other
				Composition of Functions	Function Notation
			A2.A.42 Find the composition of functions		
			A2.A.43 Determine if a function is one-to-one, onto, or both	Composition of Functions	Function Notation
				Composition of Functions	Review of Functions
				Composition of Functions	Definition of Functions
				Composition of Functions	Horizontal Line Test
			A2.A.44 Define the inverse of a function	Composition of Functions	Finding an Inverse Function
				Composition of Functions	Inverse functions
				Composition of Functions	Checking that two functions really are inverse functions of each other
				Conic Sections	Parabolas in Standard Form
			A2.A.45 Determine the inverse of a function and use composition to justify the result	Conic Sections	Parabolas in Standard Form
				Composition of Functions	Finding an Inverse Function

				Composition of Functions	Checking that two functions really are inverse functions of each other
				Composition of Functions	Inverse functions
			A2.A.46 Perform transformations with functions and relations: $f(x + a)$, $f(x) + a$, $f(-x)$, $-f(x)$, $af(x)$		
	Coordinate Geometry		A2.A.47 Determine the center-radius form for the equation of a circle in standard form	Conic Sections	Circles in Standard Form
Conic Sections				Finding the Center and Radius of a Circle	
Conic Sections				Circles	
			A2.A.48 Write the equation of a circle, given its center and a point on the circle	Conic Sections	Circles
Conic Sections				Circles in Standard Form	
Conic Sections				Finding the Center and Radius of a Circle	
			A2.A.49 Write the equation of a circle from its graph	Conic Sections	Finding the Center and Radius of a Circle
Conic Sections	Circles in Standard Form				
Conic Sections	Circles				
	A2.A.50 Approximate the solution to polynomial equations of higher degree by inspecting the graph				
	A2.A.51 Determine the domain and range of a function from its graph	Composition of Functions	Domain Restrictions		
	A2.A.52 Identify relations and functions, using graphs	Composition of Functions	Domain Restrictions		



				Composition of Functions	Horizontal Line Test
				Composition of Functions	Definition of Functions
				Composition of Functions	Function Notation
				Composition of Functions	Review of Functions
			A2.A.53 Graph exponential functions of the form $y = b$ to the power x for positive values of b , including $b = e$	Exponential and Logarithm functions	Exponential functions: an intuitive approach
				Exponential and Logarithm functions	Computations with exponential functions
				Exponential and Logarithm functions	Exponential functions: an example
				Exponential and Logarithm functions	Graphs of exponential functions
				Exponential and Logarithm functions	Introduction
				Exponential and Logarithm functions	Exponential functions: the formal definition
				Composition of Functions	Horizontal Line Test



				Composition of Functions	Domain Restrictions
			A2.A.54 Graph logarithmic functions, using the inverse of the related exponential function	Exponential and Logarithm functions	The Natural Logarithm function
				Exponential and Logarithm functions	Introduction
				Exponential and Logarithm functions	Graphs of exponential functions
				Exponential and Logarithm functions	Exponential functions: an intuitive approach
				Exponential and Logarithm functions	Graphs of logarithm functions
				Exponential and Logarithm functions	Computations with exponential functions
				Exponential and Logarithm functions	Exponential functions: the formal definition
				Exponential and Logarithm functions	The horizontal line property, and one-to-one functions
				Exponential and Logarithm	Exponential functions: an example

				functions	
				Conic Sections	Parabolas in Standard Form
				Composition of Functions	Finding an Inverse Function
				Composition of Functions	Checking that two functions really are inverse functions of each other
				Composition of Functions	Inverse functions
		Trigonometric Functions	A2.A.55 Express and apply the six trigonometric functions as ratios of the sides of a right triangle		
			A2.A.56 Know the exact and approximate values of the sine, cosine, and tangent of 0° , 30° , 45° , 60° , 90° , 180° , and 270° angles		
			A2.A.57 Sketch and use the reference angle for angles in standard position		
			A2.A.58 Know and apply the co-function and reciprocal relationships between trigonometric ratios		
			A2.A.59 Use the reciprocal and co-function relationships to find the value of the secant, cosecant, and cotangent of 0° , 30° , 45° , 60° , 90° , 180° , and 270° angles		
			A2.A.60 Sketch the unit circle and represent angles in standard position		
			A2.A.61 Determine the length of an arc of a circle, given its radius and the measure of its central angle		
			A2.A.62 Find the value of trigonometric		

		functions, if given a point on the terminal side of angle theta		
		A2.A.63 Restrict the domain of the sine, cosine, and tangent functions to ensure the existence of an inverse function		
		A2.A.64 Use inverse functions to find the measure of an angle, given its sine, cosine, or tangent		
		A2.A.65 Sketch the graph of the inverses of the sine, cosine, and tangent functions		
		A2.A.66 Determine the trigonometric functions of any angle, using technology		
		A2.A.67 Justify the Pythagorean identities		
		A2.A.68 Solve trigonometric equations for all values of the variable from 0° to 360°		
		A2.A.69 Determine amplitude, period, frequency, and phase shift, given the graph or equation of a periodic function		
		A2.A.70 Sketch and recognize one cycle of a function of the form $y = A\sin Bx =$ or $y = A\cos Bx$		
		A2.A.71 Sketch and recognize the graphs of the functions $y = \sec(x)$, $y = \csc(x)$, $y = \tan(x)$, and $y = \cot(x)$		
		A2.A.72 Write the trigonometric function that is represented by a given periodic graph		
		A2.A.73 Solve for an unknown side or angle, using the Law of Sines or the Law of Cosines		
		A2.A.74 Determine the area of a triangle or a parallelogram, given the measure of two sides and the included angle		

			A2.A.75 Determine the solution(s) from the SSA situation (ambiguous case)		
			A2.A.76 Apply the angle sum and difference formulas for trigonometric functions		
			A2.A.77 Apply the double-angle and half-angle formulas for trigonometric functions		
A2.M Measurement	Students will determine what can be measured and how, using appropriate methods and formulas.	Units of Measurement	A2.M.1 Define radian measure		
			A2.M.2 Convert between radian and degree measures		
A2.S Statistics and Probability	Students will collect, organize, display, and analyze data.	Collection of Data	A2.S.1 Understand the differences among various kinds of studies (e.g., survey, observation, controlled experiment)		
			A2.S.2 Determine factors which may affect the outcome of a survey		
		Organization and Display of Data	A2.S.3 Calculate measures of central tendency with group frequency distributions		
			A2.S.4 Calculate measures of dispersion (range, quartiles, interquartile range, standard deviation, variance) for both samples and populations		
			A2.S.5 Know and apply the characteristics of the normal distribution		
	Students will make predictions that are based upon data analysis.	Predictions from Data	A2.S.6 Determine from a scatter plot whether a linear, logarithmic, exponential, or power regression model is most appropriate		
		A2.S.7 Determine the function for the regression model, using appropriate technology, and use the regression function to interpolate and extrapolate from the data	Composition of Functions	Function Notation	

			A2.S.8 Interpret within the linear regression model the value of the correlation coefficient as a measure of the strength of the relationship		
Students will understand and apply concepts of probability.	Probability	A2.S.9 Differentiate between situations requiring permutations and those requiring combinations	Counting	Permutations	
			Counting	Counting Subsets Formula	
			Counting	Counting: An introduction to choosing subsets	
			Counting	Combinations	
		A2.S.10 Calculate the number of possible permutations ($n P r$) of n items taken r at a time	Counting	Combinations	
			Counting	Counting: An introduction to choosing subsets	
			Counting	Permutations	
			Counting	Counting Subsets Formula	
A2.S.11 Calculate the number of possible combinations ($n C r$) of n items taken r at a time					
A2.S.12 Use permutations, combinations, and the Fundamental Principle of Counting to determine the number of elements in a sample space and a specific subset (event)	Counting	Counting Subsets Formula			
	Counting	Combinations			
	Counting	Counting: An introduction to choosing subsets			
	Counting	Permutations			
A2.S.13 Calculate theoretical probabilities, including geometric applications	Counting	Probability: An introduction			
A2.S.14 Calculate empirical probabilities	Counting	Probability: An introduction			
A2.S.15 Know and apply the binomial					



			probability formula to events involving the terms exactly, at least, and at most		
			A2.S.16 Use the normal distribution as an approximation for binomial probabilities		