AVENTA LEARNING

Alignment Document
State of Kansas and Aventa Learning Algebra II

Algebra II
2005-2007 Benchmark Blueprint

Standards	Topics	Benchmarks	Unit Name	Course Topic Description
1 Number and Computation	**1.1** The student demonstrates number sense for real numbers and algebraic expressions in a variety of situations.	**1.1.1** knows, explains, and uses equivalent representations for real numbers and algebraic expressions including integers, fractions, decimals, percents, ratios; rational number bases with integer exponents; rational numbers written in scientific notation; absolute value; time; and money, e.g., -4/2 = (-2); a to the -2 power x $b^3 = b^3/a^2$.	Absolute Value Absolute Value	Shortcuts Introduction
		1.1.2 compares and orders real numbers and/or algebraic expressions and explains the relative magnitude between them, e.g., will $(5n)^2$ always, sometimes, or never be larger than 5n? The student might respond with $(5n)^2$ is greater than 5n if n > 1 and $(5n)^2$ is smaller than 5 if 0 < n < 1.		
		1.1.3 knows and explains what happens to the product or quotient when a real number is multiplied or divided by:		
		1.1.3.a a rational number greater than zero and less than one,		
		1.1.3.b a rational number greater than one,		
		1.1.3.c a rational number less than zero.		

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	1.2 The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties, and extends these properties to algebraic expressions.	**1.2.1** explains and illustrates the relationship between the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] using mathematical models, e.g., number lines or Venn diagrams.	Complex Numbers	Introduction
		1.2.2 identifies all the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] to which a given number belongs.	Complex Numbers	Introduction
		1.2.3 names, uses, and describes these properties with the real number system and demonstrates their meaning including the use of concrete objects:		
		1.2.3.a commutative (a + b = b + a and ab = ba), associative [a = (b + c) = (a + b) + c and a(bc) = (ab)c], distributive [a (b + c) = ab + ac], and substitution properties (if a = 2, then 3a = 3 x 2 = 6);		
		1.2.3.b identity properties for addition and multiplication and inverse properties of addition and multiplication (additive identity: a + 0 = a, multiplicative identity: a x 1 = a, additive inverse: +5 + -5 = 0, multiplicative inverse: 8 x 1/8 = 1);		
		1.2.3.c symmetric property of equality (if a = b, then b = a);		
		1.2.3.d addition and multiplication properties of equality (if a = b, then a + c = b + c and if a = b, then ac = bc) and inequalities (if a > b, then a + c > b + c and if a > b, and c > 0 then ac > bc);		
		1.2.3.e zero product property (if ab = 0, then a = 0 and/or b = 0).		

		1.2.4 uses and describes these properties with the real number system:		
		1.2.4.a transitive property (if a = b and b = c, then a = c),		
		1.2.4.b reflexive property (a = a).		
	1.3 The student uses computational estimation with real numbers in a variety of situations.	**1.3.1** estimates real number quantities using various computational methods including mental math, paper and pencil, concrete objects, and/or appropriate technology.		
		1.3.2 uses various estimation strategies and explains how they were used to estimate real number quantities and algebraic expressions.		
		1.3.3 knows and explains why a decimal representation of an irrational number is an approximate value.	Complex Numbers	Introduction
		1.3.4 knows and explains between which two consecutive integers an irrational number lies.	Complex Numbers	Introduction
	1.4 The student models, performs, and explains computation with real numbers and polynomials in a variety of situations.	**1.4.1** computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.		
		1.4.2 performs and explains these computational procedures:		
		1.4.2.a addition, subtraction, multiplication, and division using the order of operations;		
		1.4.2.b multiplication or division to find:		
		1.4.2.b.i a percent of a number, e.g., What is 0.5% of 10?;		
		1.4.2.b.ii percent of increase and decrease, e.g., a college raises its tuition		

		form $1,320 per year to $1,425 per year. What percent is the change in tuition?		
		1.4.2.b.iii percent one number is of another number, e.g., 89 is what percent of 82?;		
		1.4.2.b.iv a number when a percent of the number is given, e.g., 80 is 32% of what number?;		
		1.4.2.c manipulation of variable quantities within an equation or inequality, e.g., 5x - 3y = 20 could be written as 5x - 20 = 3y or 5x(2x + 3) = 8 could be written as 8/(5x) = 2x + 3;		
		1.4.2.d simplification of radical expressions (without rationalizing denominators) including square roots of perfect square monomials and cube roots of perfect cubic monomials;		
		1.4.2.e simplification or evaluation of real numbers and algebraic monomial expressions raised to a whole number power and algebraic binomial expressions squared or cubed;		
		1.4.2.f simplification of products and quotients of real number and algebraic monomial expressions using the properties of exponents;		
		1.4.2.g matrix addition, e.g., when computing (with one operation) a building's expenses (data) monthly, a matrix is created to include each of the different expenses; then at the end of the year, each type of expense for the building is totaled;		
		1.4.2.h scalar-matrix multiplication, e.g., if a matrix is created with everyone's salary		

		in it, and everyone gets a 10% raise in pay; to find the new salary, the matrix would be multiplied by 1.1.		
		1.4.3 finds prime factors, greatest common factor, multiples, and the least common multiple of algebraic expressions.		
2 Algebra	**2.1** The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.	**2.1.1** identifies, states, and continues the following patterns using various formats including numeric (list or table), algebraic (symbolic notation), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written:		
		2.1.1.a arithmetic and geometric sequences using real numbers and/or exponents; e.g., radioactive half-lives;	Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series	One very special Arithmetic Series Geometric sequences Arithmetic Series Series Sigma notation and series Series: An important example Geometric Series Arithmetic sequences

			Sequences and Series	Summation notation (also called Sigma notation)
		2.1.1.b patterns using geometric figures;		
		2.1.1.c algebraic patterns including consecutive number patterns or equations of functions, e.g., n, n + 1, n + 2,... or f(n) = 2n - 1;	Composition of Functions Composition of Functions Composition of Functions Composition of Functions	Function Notation Definition of Functions Review of Functions Horizontal Line Test
		2.1.1.d special patterns, e.g., Pascal's triangle and the Fibonacci sequence.		
		2.1.2 generates and explains a pattern.		
		2.1.3 classify sequences as arithmetic, geometric, or neither.	Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and	Sigma notation and series Series: An important example Implicitly (or Recursively) defined sequences Series Sequences Geometric sequences Arithmetic sequences

			Series	
			Sequences and Series	Introduction
			Sequences and Series	The formula 1+2+3+...+n =
			Sequences and Series	One very special Arithmetic Series
			Sequences and Series	Summation notation (also called Sigma notation)
			Sequences and Series	Explicitly defined sequences
		2.1.4 defines:		
		2.1.4.a a recursive or explicit formula for arithmetic sequences and finds any particular term,	Sequences and Series	Arithmetic sequences
			Sequences and Series	One very special Arithmetic Series
			Sequences and Series	Series
			Sequences and Series	Sigma notation and series
			Sequences and Series	Summation notation (also called Sigma notation)
			Sequences and Series	Series: An important example
			Sequences and Series	Arithmetic Series

		2.1.4.b a recursive or explicit formula for geometric sequences and finds any particular term.	Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series	Series Geometric Series Series: An important example Sigma notation and series Geometric sequences Summation notation (also called Sigma notation)
	2.2 The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in variety of situations.	**2.2.1** knows and explains the use of variables as parameters for a specific variable situation, e.g., the m and b in $y = mx + b$ or the h, k, and r in $(x - h)^2 + (y - k)^2 = r^2$.		
		2.2.2 manipulates variable quantities within an equation or inequality, e.g., $5x - 3y = 20$ could be written as $5x - 20 = 3y$ or $5x(2x + 3) = 8$ could be written as $8/(5x) = 2x + 3$.		
		2.2.3 solves:		
		2.2.3.a linear equations and inequalities both analytically and graphically;	Absolute Value Absolute Value Systems of Linear Equations	Absolute Value and Inequalities Shortcuts Summary Absolute Value and Inequalities Systems of Linear Inequalities
		2.2.3.b quadratic equations with integer		

		solutions (may be solved by trial and error, graphing, quadratic formula, or factoring);		
		2.2.3.c systems of linear equations with two unknowns using integer coefficients and constants;		
		2.2.3.d radical equations with no more than one inverse operation around the radical expression;		
		2.2.3.e equations where the solution to a rational equation can be simplified as a linear equation with a nonzero denominator, e.g., 3/(x + 2) = 5/(x - 3).		
		2.2.3.f equations and inequalities with absolute value quantities containing one variable with a special emphasis on using a number line and the concept of absolute value.	Absolute Value Absolute Value Absolute Value Absolute Value Absolute Value Absolute Value Absolute Value	Absolute Value equations in other places Absolute Value and Inequalities Shortcuts Summary Absolute Value Equations Absolute Value and Inequalities Shortcuts Shortcuts Absolute Value and Inequalities More Complicated Absolute Value Equations
		2.2.3.g exponential equations with the same base without the aid of a calculator or computer, e.g., 3 to the power (x + 2) = 3 to the fifth power.		
	2.3 The student analyzes functions in a variety of situations.	**2.3.1** evaluates and analyzes functions using various methods including mental	Exponential and Logarithm functions	The Natural Logarithm function

		math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.	Exponential and Logarithm functions	Values of logarithm functions: a look at your calculator
			Composition of Functions	Function Notation
			Composition of Functions	Definition of Functions
			Composition of Functions	Domain Restrictions
			Composition of Functions	Review of Functions
			Composition of Functions	Horizontal Line Test
		2.3.2 matches equations and graphs of constant and linear functions and quadratic functions limited to $y = ax^2 + c$.	Composition of Functions	Domain Restrictions
			Composition of Functions	Horizontal Line Test
			Quadratics	Quadratic functions in the real world
			Quadratics	Zeros of the quadratic function
			Quadratics	Introduction
			Quadratics	From the zeros to the equation of quadratic functions
			Quadratics	Quadratic functions and their graphs

			Quadratics	Factored form of quadratics
		2.3.3 determines whether a graph, list of ordered pairs, table of values, or rule represents a function.	Composition of Functions Composition of Functions Composition of Functions Composition of Functions	Inverse functions Function Notation Domain Restrictions Horizontal Line Test
		2.3.4 determines x- and y-intercepts and maximum and minimum values of the portion of the graph that is shown on a coordinate plane.		
		2.3.5 identifies domain and range of:		
		2.3.5.a relationships given the graph or table,	Composition of Functions Composition of Functions	Domain Restrictions Horizontal Line Test
		2.3.5.b linear, constant, and quadratic functions given the equation(s).	Composition of Functions Quadratics Quadratics Quadratics Quadratics Quadratics	Domain Restrictions Quadratic functions in the real world Zeros of the quadratic function Factored form of quadratics Introduction From the zeros to the equation of quadratic functions

			Quadratics	Quadratic functions and their graphs
		2.3.6 recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph.		
		2.3.7 uses function notation.	Composition of Functions Composition of Functions	Checking that two functions really are inverse functions of each other Function Notation
		2.3.8 evaluates function(s) given a specific domain.	Composition of Functions Composition of Functions Composition of Functions Composition of Functions Composition of Functions	Domain Restrictions Review of Functions Horizontal Line Test Function Notation Definition of Functions
		2.3.9 describes the difference between independent and dependent variables and identifies independent and dependent variables.		
	2.4 The student develops and uses mathematical models to represent and justify mathematical relationships found in a variety of situations involving tenth grade	**2.4.1** knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:		

	knowledge and skills.	**2.4.1.a** process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate grids) to model computational procedures, algebraic relationships, and mathematical relationships and to solve equations;		
		2.4.1.b factor trees to model least common multiple, greatest common factor, and prime factorization;		
		2.4.1.c algebraic expressions to model relationships between two successive numbers in a sequence or other numerical patterns;	Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series Sequences and Series	Series Sequences Geometric sequences Implicitly (or Recursively) defined sequences Series: An important example Explicitly defined sequences Arithmetic sequences Sigma notation and series Summation notation (also called Sigma notation)

			Sequences and Series Sequences and Series Sequences and Series	Introduction The formula 1+2+3+...+n = One very special Arithmetic Series
		2.4.1.d equations and inequalities to model numerical and geometric relationships;		
		2.4.1.e function tables to model numerical and algebraic relationships;	Composition of Functions	Function Notation
		2.4.1.f coordinate planes to model relationships between ordered pairs and equations and inequalities and linear and quadratic functions;	Quadratics Quadratics Quadratics Quadratics Quadratics Quadratics Absolute Value	From the zeros to the equation of quadratic functions Introduction Quadratic functions in the real world Factored form of quadratics Zeros of the quadratic function Quadratic functions and their graphs Absolute Value and Inequalities
		2.4.1.g constructions to model geometric theorems and properties;		
		2.4.1.h two- and three-dimensional geometric models (geoboards, dot paper, coordinate plane, nets, or solids) and real-world objects to model perimeter, area, volume, and surface area, properties of		

		two- and three-dimensional figures, and isometric views of three-dimensional figures;		
		2.4.1.i scale drawings to model large and small real-world objects;		
		2.4.1.j Pascal's Triangle to model binomial expansion and probability;	Counting Counting Counting	The values in Pascal's triangle as factorials Pascal's triangle Some computations with factorials
		2.4.1.k geometric models (spinners, targets, or number cubes), process models (concrete objects, pictures, diagrams, or coins), and tree diagrams to model probability;		
		2.4.1.l frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots, histograms, and matrices to organize and display data;		
		2.4.1.m Venn diagrams to sort data and to show relationships.		
4 Data	**4.1** The student applies probability theory to draw conclusions, generate convincing arguments, make predictions and decisions, and analyze decisions including the use of concrete objects in a variety of situations.	**4.1.1** finds the probability of two independent events in an experiment, simulation, or situation.	Counting Counting	Frequency Expectation Interpretation of probability Probability: An introduction
		4.1.2 finds the conditional probability of two dependent events in an experiment, simulation, or situation.	Counting Counting Counting	Probability: More examples Probability: An introduction Frequency Expectation Interpretation of probability

		4.1.3 explains the relationship between probability and odds and computes one given the other.	Counting	Frequency Expectation Interpretation of probability
	4.2 The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.	**4.2.1** organizes, displays, and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these data displays.		
		4.2.1.a frequency tables;		
		4.2.1.b bar, line, and circle graphs;		
		4.2.1.c Venn diagrams or other pictorial displays;		
		4.2.1.d charts and tables;		
		4.2.1.e stem-and-leaf plots (single and double);		
		4.2.1.f scatter plots;		
		4.2.1.g box-and-whiskers plots;		
		4.2.1.h histograms.		
		4.2.2 explains how the reader's bias, measurement errors, and display distortions can affect the interpretation of data.		
		4.2.3 calculates and explains the meaning of range, quartiles and interquartile range for a real number data set.		
		4.2.4 explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set.		
		4.2.5 approximates a line of best fit given a scatter plot and makes predictions using the equation of that line.		

		4.2.6 compares and contrasts the dispersion of two given sets of data in terms of range and the shape of the distribution including		
		4.2.6.a symmetrical (including normal),		
		4.2.6.b skew (left or right),		
		4.2.6.c bimodal,		
		4.2.6.d uniform (rectangular).		