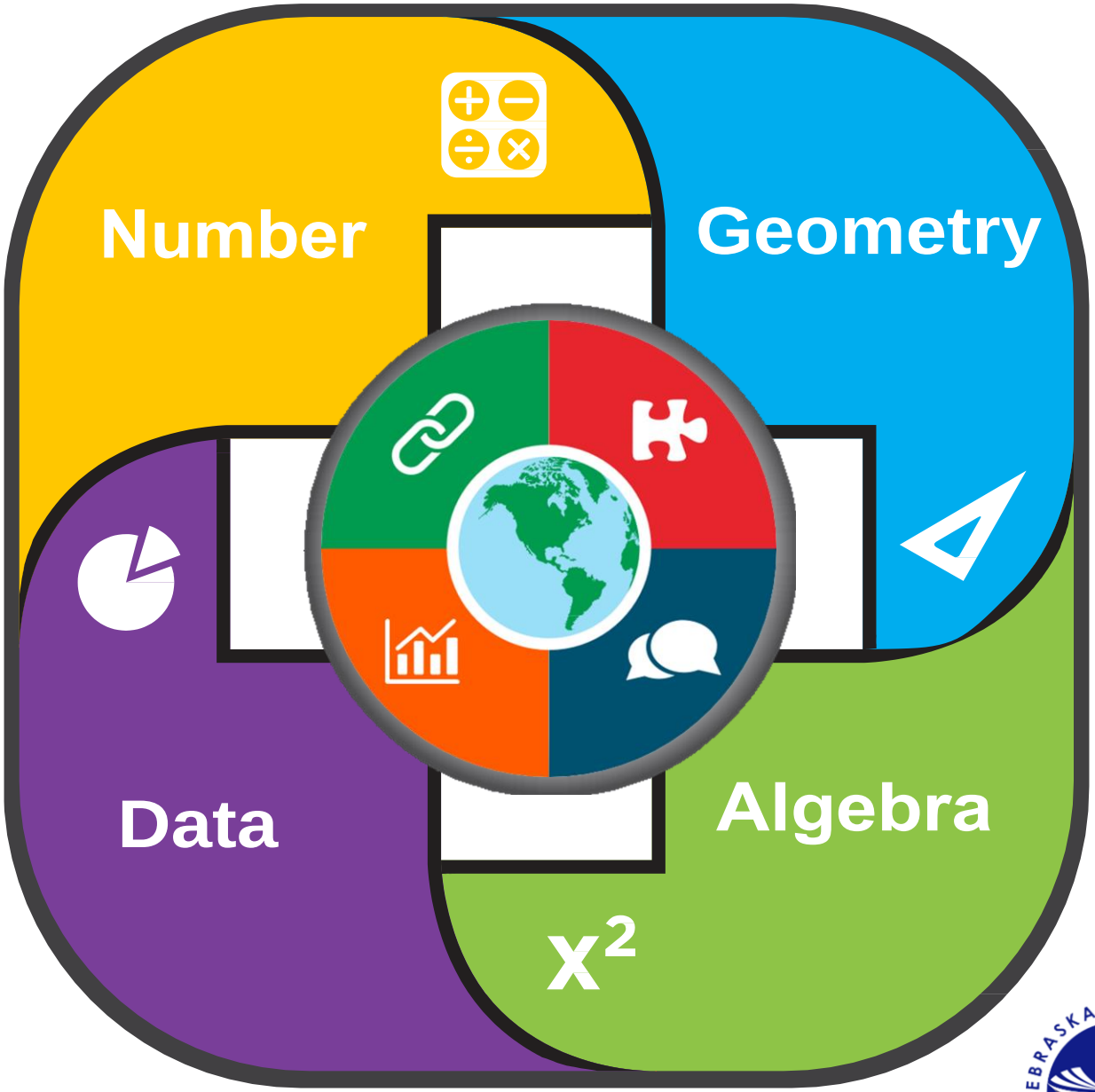
NEBRASKA MATHEMATICS STANDARDS



Approved by the Nebraska State Board of Education 9/4/15

Nebraska's College and Career Ready Standards for Mathematics

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Categories for Mathematics Standards

NUMBER: Students will communicate number concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

- **Numeric Relationships**
- **Operations**

ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

- **Algebraic Relationships**
- **Algebraic Processes**
- **Applications**

GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

- **Characteristics**
- **Coordinate Geometry**
- **Measurement**

DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

- **Representations**
- **Analysis & Applications**
- **Probability**

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NEBRASKA MATHEMATICAL PROCESSES

The Nebraska Mathematical Processes reflect overarching processes that students should master as they work towards college and career readiness. The Nebraska Mathematical Processes reflect the interaction of skills necessary for success in math coursework as well as the ability to apply math knowledge and processes within real-world contexts. The processes highlight the applied nature of math within the workforce and clarify the expectations held for the use of mathematics in and outside of the classroom.

1. **Solves mathematical problems.**
   Through the use of appropriate academic and technical tools, students will make sense of mathematical problems and persevere in solving them. Students will draw upon their prior knowledge in order to employ critical thinking skills, reasoning skills, creativity, and innovative ability. Additionally, students will compute accurately and determine the reasonableness of solutions.

2. **Models and represents mathematical problems.**
   Students will analyze relationships in order to create mathematical models given a real-world situation or scenario. Conversely, students will describe situations or scenarios given a mathematical model.

3. **Communicates mathematical ideas effectively.**
   Students will communicate mathematical ideas effectively and precisely. Students will critique the reasoning of others as well as provide mathematical justifications. Students will utilize appropriate communication approaches individually and collectively and through multiple methods, including writing, speaking, and listening.

4. **Makes mathematical connections.**
   Students will connect mathematical knowledge, ideas, and skills beyond the math classroom. This includes the connection of mathematical ideas to other topics within mathematics and to other content areas. Additionally, students will be able to describe the connection of mathematical knowledge and skills to their career interest as well as within authentic/real-world contexts.

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MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA.0.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	**MA.1.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	**MA.2.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	**MA.3.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers and simple fractions within the base-ten number system.	**MA.4.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among fractions and decimals within the base-ten number system.	**MA.5.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers, fractions, and decimals within the base-ten number system.
MA 0.1.1.a Perform the counting sequence by counting forward from any given number to 100, by ones. Count by tens to 100 starting at any decade number.	MA 1.1.1.a Count to 120 by ones and tens, starting at any given number.	MA 2.1.1.a Count within 1000, including skip-counting by 5s, 10s, and 100s starting at a variety of multiples of 5, 10 or 100.	MA 3.1.1.a Read, write and demonstrate multiple equivalent representations for numbers up to 100,000 using objects, visual representations, including standard form, word form, expanded form, and expanded notation.	MA 4.1.1.a Read, write, and demonstrate multiple equivalent representations for whole numbers up to one million and decimals to the hundredths, using objects, visual representations, standard form, word form, and expanded notation.	MA 5.1.1.a Determine multiple equivalent representations for whole numbers and decimals through the thousandths place using standard form, word form, and expanded notation.
MA 0.1.1.b Demonstrate cardinality (i.e. the last number name said indicates the number of objects counted), regardless of the arrangement or order in which the objects were counted.	MA 1.1.1.b Read and write numerals within the range of 0 – 120.	MA 2.1.1.b Read and write numbers within the range of 0 – 1,000 using standard, word, and expanded forms.	MA 3.1.1.b Compare whole numbers through the hundred thousands and represent the comparisons using the symbols >, < or =.	MA 4.1.1.b Recognize a digit in one place represents ten times what it represents in the place to its right and 1/10 what it represents in the place to its left.	MA 5.1.1.b Compare whole numbers, fractions, mixed numbers, and decimals through the thousandths place and represent comparisons using symbols <,>, or =.

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
MA 0.1.1.c Use one-to-one correspondence (pairing each object with one and only one spoken number name, and each spoken number name with one and only one object) when counting objects to show the relationship between numbers and quantities of 0 to 20.	MA 1.1.1.c Write numerals to match a representation of a given set of objects for numbers up to 120.	MA 2.1.1.c Demonstrate that each digit of a three-digit number represents amounts of hundreds, tens and ones (e.g., 387 is 3 hundreds, 8 tens, 7 ones).	MA 3.1.1.c Round a whole number to the tens or hundreds place, using place value understanding or a visual representation.	MA 4.1.1.c Classify a number up to 100 as prime or composite.	MA 5.1.1.c Round whole numbers and decimals to any given place.
MA 0.1.1.d Demonstrate the relationship between whole numbers, knowing each sequential number name refers to a quantity that is one larger.	MA 1.1.1.d Demonstrate that each digit of a two-digit number represents amounts of tens and ones, knowing 10 can be considered as one unit made of ten ones which is called a “ten” and any two-digit number can be composed of some tens and some ones (e.g., 19 is one ten and nine ones, 83 is eight tens and three ones) and can be recorded as an equation (e.g., 19 = 10 + 9).	MA 2.1.1.d Demonstrate that 100 represents a group of ten tens.	MA 3.1.1.d Represent and understand a fraction as a number on a number line.	MA 4.1.1.d Determine whether a given whole number up to 100 is a multiple of a given one-digit number.	MA 5.1.1.d Recognize and generate equivalent forms of commonly used fractions, decimals, and percents (e.g., halves, thirds, fourths, fifths, and tenths).
MA 0.1.1.e Count up to 20 objects arranged in a line, a rectangular array, or a circle. Count up to 10 objects in a scattered configuration. Count out the number of objects, given a number from 1 to 20.	MA 1.1.1.e Demonstrate that decade numbers represent a number of tens and 0 ones (e.g., 50 = 5 tens and 0 ones).	MA 2.1.1.e Compare two three-digit numbers by using symbols <, =, and > and justify the comparison based on the meanings of the hundreds, tens, and ones.	MA 3.1.1.e Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.	MA 4.1.1.e Determine factors of any whole number up to 100.	MA 5.1.1.e Write powers of 10 with exponents.
MA 0.1.1.f Write numbers 0 to 20 and represent a number of objects with a written numeral 0 to 20.	MA 1.1.1.f Compare two two-digit numbers by using symbols <, =, and > and justify the comparison based on the number of tens and ones.		MA 3.1.1.f Show and identify equivalent fractions using visual representations including pictures, manipulatives, and number lines.	MA 4.1.1.f Compare whole numbers up to one million and decimals through the hundredths place using >, <, and = symbols, and visual representations.	

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
MA 0.1.1.g Compose and decompose numbers from 11 to 19 into ten ones and some more ones by a drawing, model, or equation (e.g., 14 = 10 + 4) to record each composition and decomposition.			MA 3.1.1.g Find parts of a whole and parts of a set using visual representations.	MA 4.1.1.g Round a multi-digit whole number to any given place.	
MA 0.1.1.h Compare the number of objects in two groups by identifying the comparison as greater than, less than, or equal to by using strategies of matching and counting.			MA 3.1.1.h Explain and demonstrate how fractions ¼, ½, ¾ and a whole relate to time, measurement, and money, and demonstrate using visual representation.	MA 4.1.1.h Use decimal notation for fractions with denominators of 10 or 100.	
MA 0.1.1.i Compare the value of two written numerals between 1 and 10.			MA 3.1.1.i Compare and order fractions having the same numerators or denominators using visual representations, comparison symbols, and verbal reasoning.	MA 4.1.1.i Generate and explain equivalent fractions by multiplying by an equivalent fraction of 1.	
				MA 4.1.1.j Explain how to change a mixed number to a fraction and how to change a fraction to a mixed number.	
				MA 4.1.1.k Compare and order fractions having unlike numerators and unlike denominators using visual representations (number line), comparison symbols and verbal reasoning (e.g., using benchmarks or common numerators or common denominators).	

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
				MA 4.1.1.l Decompose a fraction into a sum of fractions with the same denominator in more than one way and record each decomposition with an equation and a visual representation.	

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA.6.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions, decimals, percents, and integers within the base-ten number system.	**MA.7.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among rational numbers within the base-ten number system.	**MA.8.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.	**MA.11.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.	**MA.12.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among the complex numbers.
MA 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	MA 8.1.1.a Determine subsets of numbers as natural, whole, integer, rational, irrational, or real, based on the definitions of these sets of numbers.	MA 11.1.1.a Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.	MA 12.1.1.a (AT) Graph complex numbers on the complex plane.
MA 6.1.1.b Represent non-negative whole numbers using exponential notation.		MA 8.1.1.b Represent numbers with positive and negative exponents and in scientific notation.	MA 11.1.1.b Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.	MA 12.1.1.b (AT) Determine the magnitude of complex numbers.
MA 6.1.1.c Compare and order rational numbers both on the number line and not on the number line.		MA 8.1.1.c Describe the difference between a rational and irrational number.	MA 11.1.1.c Use drawings, words, and symbols to explain the effects of operations such as multiplication and division on the magnitude of quantities in the real number system, including powers and roots (e.g., if you take the square root of a number, will the result always be smaller than the original number?).	MA 12.1.1.c (AT) Use matrices to represent and manipulate data.

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
MA 6.1.1.d Convert among fractions, decimals, and percents using multiple representations.		MA 8.1.1.d Approximate, compare, and order real numbers (both rational and irrational) and order real numbers both off and on the number line.		MA 12.1.1.d (AT) Recognize the role that additive and multiplicative identities play in matrix operations.
MA 6.1.1.e Determine ratios from drawings, words, and manipulatives.				MA 12.1.1.e (AT) Recognize that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
MA 6.1.1.f Explain and determine unit rates.				MA 12.1.1.f (AT) Derive and use the formulas for the general term and summation of finite arithmetic and geometric series.
MA 6.1.1.g Model integers using drawings, words, manipulatives, number lines, and symbols.				
MA 6.1.1.h Compare and order integers and absolute value both on the number line and not on the number line.				
MA 6.1.1.i Determine absolute value of rational numbers.				

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.1.2 **Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	**MA 1.1.2** **Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	**MA 2.1.2** **Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	**MA 3.1.2** **Operations:** Students will demonstrate the meaning of multiplication and division with whole numbers and compute accurately.	**MA 4.1.2** **Operations:** Students will demonstrate the meaning of addition and subtraction of whole numbers and fractions and compute accurately.	**MA 5.1.2** **Operations:** Students will demonstrate the meaning of operations and compute accurately with whole numbers, fractions, and decimals.
MA 0.1.2.a Fluently (i.e. automatic recall based on understanding) add and subtract within 5.	MA 1.1.2.a Fluently (i.e., automatic recall based on understanding) add and subtract within 10.	MA 2.1.2.a Fluently (i.e. automatic recall based on understanding) add and subtract within 20.	MA 3.1.2.a Add and subtract within 1,000 with or without regrouping.	MA 4.1.2.a Add and subtract multi-digit numbers using the standard algorithm.	MA 5.1.2.a Multiply multi-digit whole numbers using the standard algorithm.
	MA 1.1.2.b Add and subtract within 20, using a variety of strategies (e.g., count on to make a ten).	MA 2.1.2.b Add and subtract within 100 using strategies based on place value, including the standard algorithm, properties of operations, and/or the relationship between addition and subtraction.	MA 3.1.2.b Select and apply the appropriate methods of computation when solving one- and two- step addition and subtraction problems with four-digit whole numbers through the thousands (e.g., visual representations, mental computation, paper-pencil).	MA 4.1.2.b Multiply a four-digit whole number by a one-digit whole number.	MA 5.1.2.b Divide four-digit whole numbers by a two-digit divisor, with and without remainders using the standard algorithm.
	MA 1.1.2.c Find the difference between two numbers that are multiples of 10, ranging from 10 – 90 using concrete models, drawings or strategies, and write the corresponding equation (e.g., 90 – 70 = 20).	MA 2.1.2.c Mentally add or subtract 10 or 100 to/from a given number 100-900.	MA 3.1.2.c Use drawings, words, arrays, symbols, repeated addition, equal groups, and number lines to explain the meaning of multiplication.	MA 4.1.2.c Multiply a two-digit whole number by a two-digit whole number using the standard algorithm.	MA 5.1.2.c Multiply a whole number by a fraction or a fraction by a fraction using models and visual representations.
	MA 1.1.2.d Mentally find 10 more or 10 less than a two-digit number without having to count and explain the reasoning used (e.g., 33 is 10 less than 43).	MA 2.1.2.d Add up to three two-digit numbers using strategies based on place value and understanding of properties.	MA 3.1.2.d Use words and symbols to explain the meaning of the Zero Property and Identity Property of multiplication.	MA 4.1.2.d Divide up to a four-digit whole number by a one-digit divisor with and without a remainder.	MA 5.1.2.d Divide a unit fraction by a whole number and a whole number by a unit fraction.

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
	MA 1.1.2.e Add within 100, which may include adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of ten using concrete models, drawings, and strategies which reflect understanding of place value.	MA 2.1.2.e Add and subtract within 1000, using concrete models, drawings, and strategies, which reflect understanding of place value and properties of operations.	MA 3.1.2.e Multiply one digit whole numbers by multiples of 10 in the range of 10 to 90.	MA 4.1.2.e Use drawings, words, and symbols to explain the meaning of addition and subtraction of fractions with like denominators.	MA 5.1.2.e Explain division of a whole number by a fraction using models and visual representations.
		MA 2.1.2.f Use addition to find the total number of objects arranged in an array no larger than five rows and five columns and write an equation to express the total (e.g., 3 + 3 + 3 = 9).	MA 3.1.2.f Use objects, drawings, arrays, words and symbols to explain the relationship between multiplication and division (e.g., if 3 x 4 = 12 then 12 ÷ 3 = 4).	MA 4.1.2.f Add and subtract fractions and mixed numbers with like denominators.	MA 5.1.2.f Interpret a fraction as division of the numerator by the denominator.
			MA 3.1.2.g Fluently (i.e. automatic recall based on understanding) multiply and divide within 100.	MA 4.1.2.g Multiply a fraction by a whole number.	MA 5.1.2.g Add, subtract, multiply, and divide decimals to the hundredths using concrete models or drawings and strategies based on place value, properties of operations (i.e. Commutative, Associative, Distributive, Identity, Zero), and/or relationships between operations.
			MA 3.1.2.h Determine the reasonableness of whole number sums and differences in real-world problems using estimation, compatible numbers, mental computations, or other strategies.	MA 4.1.2.h Determine the reasonableness of whole number products and quotients in real-world problems using estimation, compatible numbers, mental computations, or other strategies.	MA 5.1.2.h Add and subtract fractions and mixed numbers with unlike denominators.

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
					MA 5.1.2.i Determine the reasonableness of computations involving whole numbers, fractions, and decimals.
					MA 5.1.2.j Multiply and divide by powers of 10.

MA K-12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.1.2 Operations: Students will compute with fractions and decimals accurately.	**MA 7.1.2 Operations:** Students will compute with rational numbers accurately.	**MA 8.1.2 Operations:** Students will compute with exponents and roots.	**MA 11.1.2 Operations:** Students will compute with real and complex numbers.	**MA 12.1.2 Operations:** Students will compute with matrices.
MA 6.1.2.a Multiply and divide non-negative fractions and mixed numbers.	MA 7.1.2.a Solve problems using proportions and ratios (e.g., cross products, percents, tables, equations, and graphs).	MA 8.1.2.a Evaluate the square roots of perfect squares less than or equal to 400 and cube roots of perfect cubes less than or equal to 125.	MA 11.1.2.a Compute with subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.	MA 12.1.2.a (AT) Multiply matrices by scalars to produce new matrices.
MA 6.1.2.b Evaluate expressions with positive exponents.	MA 7.1.2.b Add, subtract, multiply, and divide rational numbers (e.g., positive and negative fractions, decimals, and integers).	MA 8.1.2.b Simplify numerical expressions involving exponents and roots (e.g., $4^{(-2)}$ is the same as 1/16).	MA 11.1.2.b Simplify expressions with rational exponents.	MA 12.1.2.b (AT) Add, subtract, and multiply matrices of appropriate dimensions.
MA 6.1.2.c Divide multi-digit whole numbers using the standard algorithm.	MA 7.1.2.c Apply properties of operations as strategies for problem solving with rational numbers.	MA 8.1.2.c Simplify numerical expressions involving absolute value.	MA 11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).	
MA 6.1.2.d Add, subtract, multiply, and divide decimals using the standard algorithms.	MA 7.1.2.d Use multiple strategies to add, subtract, multiply, and divide integers.	MA 8.1.2.d Multiply and divide numbers using scientific notation.	MA 11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number.	
MA 6.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.	MA 7.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.	MA 8.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.		

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	**MA 1.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.	**MA 2.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.	**MA 3.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.	**MA 4.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.	**MA 5.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.
MA 0.2.1.a Decompose numbers less than or equal to 10 into pairs in more than one way, showing each decomposition with a model, drawing, or equation (e.g., 7 = 4 + 3 and 7 = 1 + 6).	MA 1.2.1.a Use the meaning of the equal sign to determine if equations are true and give examples of equations that are true (e.g., 4 = 4, 6 = 7 – 1, 6 + 3 = 3 + 6, and 7 + 2 = 5 + 4).	MA 2.2.1.a Identify a group of objects from 0-20 as even or odd by counting by 2's or by showing even numbers as a sum of two equal parts.	MA 3.2.1.a Identify arithmetic patterns (including patterns in the addition or multiplication tables) using properties of operations.	MA 4.2.1.a Create a simple algebraic expression or equation using a variable for an unknown number to represent a math process (e.g., 3 + n = 15, 81 ÷ n = 9).	MA 5.2.1.a Form ordered pairs from a rule such as y=2x, and graph the ordered pairs on a coordinate plane.
MA 0.2.1.b For any number from 1 to 9, find the number that makes 10 when added to the given number, showing the answer with a model, drawing, or equation.	MA 1.2.1.b Use the relationship of addition and subtraction to solve subtraction problems (e.g., find 12 – 9 = ___, using the addition fact 9 + 3 = 12).		MA 3.2.1.b Interpret a multiplication equation as equal groups (e.g., interpret 4 × 6 as the total number of objects in four groups of six objects each). Represent verbal statements of equal groups as multiplication equations.	MA 4.2.1.b Generate and analyze a number or shape pattern to follow a given rule, such as y = 3x + 5 is a rule to describe a relationship between two variables and can be used to find a second number when a first number is given.	
	MA 1.2.1.c Find numerical patterns to make connections between counting and addition and subtraction (e.g., adding two is the same as counting on two).				
	MA 1.2.1.d Determine the unknown whole number in an addition or subtraction equation (e.g. 7 + ? = 13).				

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	**MA 7.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	**MA 8.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	**MA 11.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with functions.	**MA 12.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions.
MA 6.2.1.a Create algebraic expressions (e.g., one operation, one variable as well as multiple operations, one variable) from word phrases.	MA 7.2.1.a Describe and create an inequality from words and pictures (e.g., one-step, one-variable).	MA 8.2.1.a Create algebraic expressions, equations, and inequalities (e.g., two-step, one variable) from word phrases, tables, and pictures.	MA 11.2.1.a Define a function and use function notation.	MA 12.2.1.a (AT) Analyze and graph non-linear functions (e.g., quadratic, trigonometric, square root, logarithmic, rational, higher-order polynomials, exponential, absolute value, piecewise, and sinusoidal).
MA 6.2.1.b Recognize and generate equivalent algebraic expressions involving distributive property and combining like terms.	MA 7.2.1.b Represent real-world situations with proportions.	MA 8.2.1.b Determine and describe the rate of change for given situations through the use of tables and graphs.	MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.	MA 12.2.1.b (AT) Use the unit circle to define the trigonometric functions on all real numbers.
MA 6.2.1.c Represent and analyze the relationship between two variables using graphs, tables, and one-step equations.		MA 8.2.1.c Describe equations and linear graphs as having one solution, no solution, or infinitely many solutions.	MA 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.	MA 12.2.c. (AT) Evaluate sine, cosine, and tangent functions at positive and negative multiples of 30, and 45 degrees.
		MA 8.2.1.d Graph proportional relationships and interpret the slope.	MA 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form.	MA 12.2.2.d (AT) Create new functions out of existing functions using addition, subtraction, multiplication, division, translation, dilation, and composition.

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
			MA 11.2.1.e Analyze and graph linear functions and inequalities (point-slope form, slope-intercept form, standard form, intercepts, rate of change, parallel and perpendicular lines, vertical and horizontal lines, and inequalities).	MA 12.2.1.e (AT) Use limits to describe the behavior of a function near its asymptotes and removable discontinuities.
			MA 11.2.1.f Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using the piecewise definition).	MA 12.2.1.f (AT) Understand that the radian measure of an angle is the length of the arc on the unit circle subtended by that angle.
			MA 11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).	MA 12.2.1.g (AT) Convert between radian and degree measures of an angle.
			MA 11.2.1.h Represent, interpret, and analyze inverses of functions algebraically and graphically.	

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.2.2 Algebraic Processes: Students will apply the operational properties when adding and subtracting.	**MA 1.2.2 Algebraic Processes:** Students will apply the operational properties when adding and subtracting.	**MA 2.2.2 Algebraic Processes:** Students will apply the operational properties when adding and subtracting.	**MA 3.2.2 Algebraic Processes:** Student will apply the operational properties when multiplying and dividing.	**MA 4.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving equations.	**MA 5.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving equations.
No additional indicator(s) at this level.	MA 1.2.2.a Decompose numbers and use the commutative and associative properties of addition to develop addition and subtraction strategies including (making 10's and counting on from the larger number) to add and subtract basic facts within 20 (e.g., decomposing to make 10, 7 + 5 = 7 + 3 + 2 = 10 + 2 = 12; using the commutative property to count on 2 + 6 = 6 + 2; and using the associative property to make 10, 5 + 3 + 7 = 5 + (3 + 7) = 5 + 10).	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	MA 3.2.2.a Apply the commutative, associative, and distributive properties as strategies to multiply and divide.	MA 4.2.2.a Solve one- and two-step problems which use any or all of the four basic operations and include the use of a letter to represent the unknown quantity.	MA 5.2.2.a Interpret and evaluate numerical or algebraic expressions using order of operations (excluding exponents).
			MA 3.2.2.b Solve one-step whole number equations involving addition, subtraction, multiplication, or division, including the use of a letter to represent the unknown quantity.		

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving expressions, equations, and inequalities.	**MA 7.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions, and solving equations and inequalities.	**MA 8.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving expressions, equations, and inequalities.	**MA 11.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities.	**MA 12.2.2 Algebraic Processes:** Students will apply the identities when evaluating and solving trigonometric equations.
MA 6.2.2.a Simplify expressions using the distributive property and combining like terms.	MA 7.2.2.a Solve equations using the distributive property and combining like terms.	MA 8.2.2.a Solve multi-step equations involving rational numbers with the same variable appearing on both sides of the equal sign.	MA 11.2.2.a Convert equivalent rates (e.g., miles per hour to feet per second).	MA 12.2.2.a (AT) Use trigonometric identities to solve trigonometric equations.
MA 6.2.2.b Use substitution to determine if a given value for a variable makes an equation or inequality true.	MA 7.2.2.b Use factoring and properties of operations to create equivalent algebraic expressions (e.g., $2x + 6 = 2(x + 3)$).	MA 8.2.2.b Solve two-step inequalities involving rational numbers and represent solutions on a number line.	MA 11.2.2.b Identify and explain the properties used in solving equations and inequalities.	MA 12.2.2.b (AT) Explain symmetry (odd and even) and periodicity of trigonometric functions.
MA 6.2.2.c Evaluate numerical expressions, including absolute value and exponents, with respect to order of operations.	MA 7.2.2.c Given the value of the variable(s), evaluate algebraic expressions (including absolute value).		MA 11.2.2.c Simplify algebraic expressions involving integer and fractional exponents.	MA 12.2.2.c (AT) Create an invertible function from a non-invertible function by restricting the domain (e.g.,arcsin, arccos, and arctan).
MA 6.2.2.d Given the value of the variable, evaluate algebraic expressions (which may include absolute value) with respect to order of operations (non-negative rational numbers).	MA 7.2.2.d Solve two-step equations involving rational numbers which include the integers.		MA 11.2.2.d Perform operations on rational expressions (add, subtract, multiply, divide, and simplify).	MA 12.2.2.d (AT) Find the period, amplitude, and midline of a trigonometric function of the form $y=A + B\sin(Cx)$, where A, B, and C are parameters, and identify these properties on a graph of the function.
MA 6.2.2.e Solve one-step equations with non-negative rational numbers using addition, subtraction, multiplication and division.	MA 7.2.2.e Solve one-step inequalities involving integers and rational numbers and represent solutions on a number line.		MA 11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).	
MA 6.2.2.f Use equivalent ratios relating quantities with whole numbers to create a table. Find missing values in the table.			MA 11.2.2.f Solve an equation involving several variables for one variable in terms of the others.	

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
MA 6.2.2.g Represent inequalities on a number line (e.g., graph x > 3).			MA 11.2.2.g Solve linear and absolute value equations and inequalities.	
			MA 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.	
			MA 11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.	
			MA 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.	
			MA 11.2.2 k. Recognize polynomial multiplication patterns and their related factoring patterns (e.g., $(a + b)^2 = a^2 + 2ab + b^2$, $a^2 – b^2 = (a + b)(a - b)$).	
			MA 11.2.2.l Make the connection between the factors of a polynomial and the zeros of a polynomial.	
			MA 11.2.2.m Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.	
			MA 11.2.2.n Solve quadratic equations involving real coefficients and real or imaginary roots.	

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.2.3 Applications: Students will solve real-world problems involving addition and subtraction.	**MA 1.2.3 Applications**: Students will solve real-world problems involving addition and subtraction.	**MA 2.2.3 Applications**: Students will solve real-world problems involving addition and subtraction.	**MA 3.2.3 Applications**: Students will solve real-world problems involving equations with whole numbers.	**MA 4.2.3 Applications**: Students will solve real-world problems involving equations with fractions.	**MA 5.2.3 Applications**: Students will solve real-world problems involving equations with fractions and mixed numbers.
MA 0.2.3.a Solve real-world problems that involve addition and subtraction within 10 (e.g., by using objects, drawings or equations to represent the problem).	MA 1.2.3.a Solve real-world problems involving addition and subtraction within 20 in situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all parts of the addition or subtraction problem (e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem).	MA 2.2.3.a Solve real-world problems involving addition and subtraction within 100 in situations of addition and subtraction, including adding to, subtracting from, joining and separating, and comparing situations with unknowns in all positions using objects, models, drawings, verbal explanations, expressions and equations.	MA 3.2.3.a Solve real-world problems involving two-step equations (involving two operations) involving whole numbers using addition and subtraction.	MA 4.2.3.a Solve real-world problems involving multi-step equations involving whole numbers using the four operations, including interpreting remainders.	MA 5.2.3.a Solve real-world problems involving addition and subtraction of fractions and mixed numbers with like and unlike denominators.
	MA 1.2.3.b Solve real-world problems that include addition of three whole numbers whose sum is less than or equal to 20 by using objects, drawings, and equations with a symbol to represent the unknown number in the problem.	MA 2.2.3.b Create real-world problems to represent one- and two-step addition and subtraction within 100, with unknowns in all positions.	MA 3.2.3.b Write an equation (e.g., one operation, one variable) to represent real-world problems involving whole numbers.	MA 4.2.3.b Solve real-world problems involving addition and subtraction of fractions and mixed numbers with like denominators.	
	MA 1.2.3.c Create a real-world problem to represent a given equation involving addition and subtraction within 20.				

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.2.3 Applications: Students will solve real-world problems involving ratios, unit rates, and percents.	**MA 7.2.3 Applications**: Students will solve real-world problems involving expressions, equations, and inequalities.	**MA 8.2.3 Applications**: Students will solve real-world problems involving multi-step equations and multi-step inequalities.	**MA 11.2.3 Applications**: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions.	**MA 12.2.3 Applications**: Students will solve real-world problems involving trigonometric functions.
MA 6.2.3.a Write equations (e.g., one operation, one variable) to represent real-world problems involving non-negative rational numbers.	MA 7.2.3.a Describe and write linear equations from words and tables.	MA 8.2.3.a Describe and write equations from words, patterns, and tables.	MA 11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions).	MA 12.2.3.a (AT) Model periodic events with specified amplitude, frequency, and shifts.
MA 6.2.3.b Solve real-world problems involving non-negative rational numbers.	MA 7.2.3.b Write a two-step equation to represent real-world problems involving rational numbers in any form.	MA 8.2.3.b Write a multi-step equation to represent real-world problems using rational numbers in any form.		MA 12.2.3.b (AT) Solve real-world problems using trigonometric and inverse trigonometric functions.
MA 6.2.3.c Solve real-world problems involving percents of numbers.	MA 7.2.3.c Solve real-world problems with equations that involve rational numbers in any form.	MA 8.2.3.c Solve real-world multi-step problems involving rational numbers in any form.		
MA 6.2.3.d Solve real-world problems using ratios and unit rates.	MA 7.2.3.d Solve real-world problems with inequalities.			

MA K-12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
	MA 7.2.3.e Use proportional relationships to solve real-world problems, including percent problems, (e.g., % increase, % decrease, mark-up, tip, simple interest).			
	MA 7.2.3.f Solve real-world problems involving scale drawings using a proportional relationship.			

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 1.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 2.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 3.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 4.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 5.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.
MA 0.3.1.a Describe real-world objects using names of shapes, regardless of their orientation or size (e.g., squares, circles, triangles, rectangles, hexagons, cubes, cones, spheres, and cylinders).	MA 1.3.1.a Determine defining and non-defining attributes of two-dimensional shapes; build and draw shapes that match the given definition.	MA 2.3.1.a Recognize and draw shapes having a specific number of angles, faces, or other attributes, including triangles, quadrilaterals, pentagons, and hexagons.	MA 3.3.1.a Identify the number of sides, angles, and vertices of two-dimensional shapes.	MA 4.3.1.a Recognize angles as geometric shapes that are formed where two rays share a common endpoint.	MA 5.3.1.a Identify three-dimensional figures including cubes, cones, pyramids, prisms, spheres, and cylinders.
MA 0.3.1.b Identify shapes as two-dimensional (“flat”) or three-dimensional (“solid”).	MA 1.3.1.b Decompose circles and rectangles into two and four equal parts, using the terms “halves”, “fourths” and “quarters”, and use the phrases “half of”, “fourths of”, and “quarter of”.	MA 2.3.1.b Partition a rectangle into rows and columns of equal sized squares. Count to find the total.	MA 3.3.1.b Sort quadrilaterals into categories (e.g., rhombuses, squares, and rectangles).	MA 4.3.1.b Classify an angle as acute, obtuse, or right.	MA 5.3.1.b Identify faces, edges, and vertices of rectangular prisms.
MA 0.3.1.c Compare and analyze two- and three-dimensional shapes, with different sizes and orientations to describe their similarities, differences, parts (e.g., number “corners”/vertices), and other attributes (e.g., sides of equal length).	MA 1.3.1.c Use two-dimensional shapes (e.g., rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) and three-dimensional shapes (e.g., cubes, rectangular prisms, cones, and cylinders) to compose and describe new shapes.	MA 2.3.1.c Divide circles and rectangles into two, three, or four equal parts. Describe the parts using the language of halves, thirds, fourths, half of, a third of, a fourth of.	MA 3.3.1.c Draw lines to separate two-dimensional figures into equal areas, and express the area of each part as a unit fraction of the whole.	MA 4.3.1.c Identify and draw points, lines, line segments, rays, angles, parallel lines, perpendicular lines, and intersecting lines, and recognize them in two-dimensional figures.	MA 5.3.1.c Justify the classification of two-dimensional figures based on their properties.

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
MA 0.3.1.d Model shapes found in the real world by building shapes from materials (e.g., clay and pipe cleaners) and drawing shapes.		MA 2.3.1.d Recognize that equal shares of identical wholes need not have the same shape.		MA 4.3.1.d Classify two-dimensional shapes based on the presence or absence of parallel and perpendicular lines, or the presence or absence of specific angles.	
MA 0.3.1.e Combine simple shapes to compose larger shapes (e.g., use triangle pattern blocks to build a hexagon).				MA 4.3.1.e Identify right triangles.	
				MA 4.3.1.f Measure angles in whole number degrees using a protractor.	
				MA 4.3.1.g Sketch angles of a specified measure.	
				MA 4.3.1.h Recognize and draw lines of symmetry in two-dimensional shapes.	

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 7.3.1 Characteristics:** Students will identify and describe geometric characteristics of two-dimensional shapes.	**MA 8.3.1 Characteristics:** Students will identify and describe geometric characteristics of two-dimensional shapes.	**MA 11.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	**MA 12.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.
MA 6.3.1.a Identify and create nets to represent two-dimensional drawings of prisms, pyramids, cylinders, and cones.	MA 7.3.1.a Apply and use properties of adjacent, complementary, supplementary, and vertical angles to find missing angle measures.	MA 8.3.1.a Determine and use the relationships of the interior angles of a triangle to solve for missing measures.	MA 11.3.1.a Know and use precise definitions of ray, line segment, angle, perpendicular lines, parallel lines, and congruence based on the undefined terms of geometry: point, line and plane.	MA 12.3.1.a (AT) Apply the Law of Sines and the Law of Cosines to find unknown measures in triangles.
	MA 7.3.1.b Draw triangles (freehand, using a ruler and a protractor, and using technology) with given conditions of three measures of angles or sides, and notice when the conditions determine a unique triangle, more than one triangle, or no triangle.	MA 8.3.1.b Identify and apply geometric properties of parallel lines cut by a transversal and the resulting corresponding, alternate interior, and alternate exterior angles to find missing measures.	MA 11.3.1.b Prove geometric theorems about angles, triangles, congruent triangles, similar triangles, parallel lines with transversals, and quadrilaterals using deductive reasoning.	MA 12.3.1.b (AT) Prove and apply properties of lengths of chords, secant segments, and tangent segments.
			MA 11.3.1.c Apply geometric properties to solve problems involving similar triangles, congruent triangles, quadrilaterals, and other polygons.	
			MA 11.3.1.d Identify and apply right triangle relationships including sine, cosine, tangent, special right triangles, and the converse of the Pythagorean Theorem.	

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
			MA 11.3.1.e Create geometric models to visualize, describe, and solve problems using similar triangles, right triangles, and trigonometry.	
			MA 11.3.1.f Know and use precise definitions and terminology of circles, including central angle, inscribed angle, arc, intercepted arc, chord, secant, and tangent.	
			MA 11.3.1.g Apply the properties of central angles, inscribed angles, angles formed by intersecting chords, and angles formed by secants and/or tangents to find the measures of angles related to the circle.	
			MA 11.3.1.h Sketch, draw, and construct appropriate representations of geometric objects using a variety of tools and methods which may include ruler/straight edge, protractor, compass, reflective devices, paper folding, or dynamic geometric software.	

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	**MA 1.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 2.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 3.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 4.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 5.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.
MA 0.3.2.a Describe the relative positions of objects (e.g., above, below, beside, in front of, behind, next to, between).	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	MA 5.3.2.a Identify the origin, x axis, and y axis of the coordinate plane.
					MA 5.3.2.b Graph and name points in the first quadrant of the coordinate plane using ordered pairs of whole numbers.

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	**MA 7.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 8.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 11.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.	**MA 12.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.
MA 6.3.2.a Identify the ordered pair of a given point in the coordinate plane.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	MA 8.3.2.a Perform and describe positions and orientation of shapes under single transformations including rotations (in multiples of 90 degrees about the origin), translations, reflections, and dilations on and off the coordinate plane.	MA 11.3.2.a Derive and apply the midpoint formula.	MA 12.3.2.a (AT) Identify features of a function (e.g., local and global maxima and minima, concavity, approximate locations of points of inflection and vertical and horizontal asymptotes) from its graph.
MA 6.3.2.b Plot the location of an ordered pair in the coordinate plane.		MA 8.3.2.b Find congruent two-dimensional figures and define congruence in terms of a series of transformations.	MA 11.3.2.b Use coordinate geometry to analyze linear relationships to determine if lines are parallel or perpendicular.	MA 12.3.2.b (AT) Identify symmetry properties of a function (e.g., axis of symmetry of a parabola) and know the connection between its symmetry properties and specific transformations.
MA 6.3.2.c Identify the quadrant of a given point in the coordinate plane.		MA 8.3.2.c Find similar two-dimensional figures and define similarity in terms of a series of transformations.	MA 11.3.2.c Given a line, write the equation of a line that is parallel or perpendicular to it.	MA 12.3.2.c (AT) Recognize that vector quantities have both magnitude and direction and can be represented by directed line segments.
MA 6.3.2.d Draw polygons in the coordinate plane given coordinates for the vertices.			MA 11.3.2.d Derive and apply the distance formula.	MA 12.3.2.d (AT) Add and subtract vectors graphically and algebraically.
MA 6.3.2.e Calculate vertical and horizontal distances in the coordinate plane to find perimeter and area.			MA 11.3.2.e Use coordinate geometry to prove triangles are right, acute, obtuse, isosceles, equilateral, or scalene.	MA 12.3.2.e (AT) Perform scalar multiplication of a vector and show it graphically.

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
			MA 11.3.2.f Use coordinate geometry to prove quadrilaterals are trapezoids, isosceles trapezoids, parallelograms, rectangles, rhombi, kites, or squares.	MA 12.3.2.f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters.
			MA 11.3.2.g Perform and describe positions and orientation of shapes under a single translation using algebraic notation on a coordinate plane.	MA 12.3.2.g (AT) Determine the three-dimensional object created by rotating or revolving a two-dimensional object about an axis.
			MA 11.3.2.h Perform and describe positions and orientation of shapes under a rotation about the origin in multiples of 90 degrees using algebraic notation on a coordinate plane.	MA 12.3.2.h (AT) Determine the shape of a two-dimensional cross-section of a three-dimensional object.
			MA 11.3.2.i Perform and describe positions and orientation of shapes under a reflection across a line using algebraic notation on a coordinate plane.	
			MA 11.3.2.j Perform and describe positions and orientation of shapes under a single dilation on a coordinate plane.	
			MA 11.3.2.k Derive the equation of a circle given the radius and the center.	

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.3.3 Measurement: Students will perform and compare measurements and apply formulas.	**MA 1.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 2.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 3.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 4.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 5.3.3 Measurement:** Students will perform and compare measurements and apply formulas.
MA 0.3.3.a Describe measurable attributes of real-world objects (e.g., length or weight).	MA 1.3.3.a Identify, name, and understand the value of dimes and pennies (e.g., a dime is equal to ten pennies) relating to tens and ones, and solve real-world problems involving dimes and pennies, using ¢ symbol appropriately (e.g., If you have four dimes and two pennies, how many cents do you have?).	MA 2.3.3.a Solve real-world problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.	MA 3.3.3.a Find the perimeter of polygons given the side lengths, and find an unknown side length.	MA 4.3.3.a Apply perimeter and area formulas for rectangles.	MA 5.3.3.a Recognize that solid figures have volume that is measured in cubic units.
MA 0.3.3.b Compare length and weight of two objects (e.g., longer/shorter, heavier/lighter).	MA 1.3.3.b Tell and write time to the half hour and hour using analog and digital clocks.	MA 2.3.3.b Identify and write time to five-minute intervals using analog and digital clocks and both a.m. and p.m.	MA 3.3.3.b Tell and write time to the minute using both analog and digital clocks.	MA 4.3.3.b Identify and use the appropriate tools, operations, and units of measurement, both customary and metric, to solve real-world problems involving time, length, weight, mass, capacity, and volume.	MA 5.3.3.b Use concrete models to measure the volume of rectangular prisms in cubic units by counting cubic units.
	MA 1.3.3.c Measure objects by using a shorter object end-to-end and know that the length of the object is the amount of same-size objects that span it lined up end-to-end.	MA 2.3.3.c Identify and use appropriate tools for measuring length (e.g., ruler, yardstick, meter stick, and measuring tape).	MA 3.3.3.c Solve real-world problems involving addition and subtraction of time intervals and find elapsed time.	MA 4.3.3.c Generate simple conversions from a larger unit to a smaller unit within the customary and metric systems of measurement.	MA 5.3.3.c Generate conversions within the customary and metric systems of measurement.

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
	MA 1.3.3.d Order three objects by directly comparing their lengths, or indirectly by using a third object.	MA 2.3.3.d Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.	MA 3.3.3.d Identify and use the appropriate tools and units of measurement, both customary and metric, to solve real-world problems involving length, weight, mass, liquid volume, and capacity (within the same system and unit).		
		MA 2.3.3.e Measure and estimate lengths using inches, feet, centimeters, and meters.	MA 3.3.3.e Estimate and measure length to the nearest half inch, quarter inch, and centimeter.		
		MA 2.3.3.f Compare the difference in length of objects using inches and feet or centimeters and meters.	MA 3.3.3.f Use concrete and pictorial models to measure areas in square units by counting square units.		
		MA 2.3.3.g Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, etc., and represent whole number sums and differences within 100 on a number line.	MA 3.3.3.g Find the area of a rectangle with whole-number side lengths by modeling with unit squares, and show that the area is the same as would be found by multiplying the side lengths.		
		MA 2.3.3.h Use measurement lengths and addition and subtraction within 100 to solve real-world problems.	MA 3.3.3.h Identify and draw rectangles with the same perimeter and different areas or with the same area and different perimeters.		

MA K-12.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.3.3 Measurement: Students will perform and compare measurements and apply formulas.	**MA 7.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 8.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 11.3.3 Measurement:** Students will perform and compare measurements and apply formulas.	**MA 12.3.3 Measurement:** Students will perform and compare measurements and apply formulas.
MA 6.3.3.a Determine the area of quadrilaterals, including parallelograms, trapezoids, and triangles by composition and decomposition of polygons as well as application of formulas.	MA 7.3.3.a Solve real-world problems involving perimeter and area of composite shapes made from triangles, quadrilaterals and polygons.	MA 8.3.3.a Explain a model of the Pythagorean Theorem.	MA 11.3.3.a Convert between various units of length, area, and volume (e.g., such as square feet to square yards).	MA 12.3.3.a (AT) Use Cavalieri's Principle to determine the volume of a sphere and other solid figures.
MA 6.3.3.b Determine the surface area of rectangular prisms and triangular prisms using nets.	MA 7.3.3.b Solve real-world problems involving surface area and volume of composite shapes made from rectangular and triangular prisms.	MA 8.3.3.b Apply the Pythagorean Theorem to find side lengths of triangles and to solve real-world problems.	MA 11.3.3.b Convert between metric and standard units of measurement.	MA 12.3.3.b (AT) Determine the tolerance interval and percent of error in measurement.
MA 6.3.3.c Apply volume formulas for rectangular prisms.	MA 7.3.3.c Determine the area and circumference of circles both on and off the coordinate plane.	MA 8.3.3.c Find the distance between any two points on the coordinate plane using the Pythagorean Theorem.	MA 11.3.3.c Apply the effect of a scale factor to determine the length, area, and volume of similar two- and three-dimensional shapes and solids.	
		MA 8.3.3.d Determine the volume of cones, cylinders, and spheres, and solve real-world problems using volumes.	MA 11.3.3.d Find arc length and area of sectors of a circle.	
			MA 11.3.3.e Determine surface area and volume of spheres, cones, pyramids, and prisms using formulas and appropriate units.	

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.4.1 Representations: Students will create displays that represent data.	**MA 1.4.1 Representations:** Students will create displays that represent data.	**MA 2.4.1 Representations:** Students will create displays that represent data.	**MA 3.4.1 Representations:** Students will create displays that represent data.	**MA 4.4.1 Representations:** Students will create displays that represent data.	**MA 5.4.1 Representations:** Students will create displays that represent data.
No additional indicator(s) at this level.	MA 1.4.1.a Organize and represent a data set with up to three categories using a picture graph.	MA 2.4.1.a Create and represent a data set using pictographs and bar graphs to represent a data set with up to four categories.	MA 3.4.1.a Create scaled pictographs and scaled bar graphs to represent a data set—including data collected through observations, surveys, and experiments—with several categories.	MA 4.4.1.a Represent data using line plots where the horizontal scale is marked off in appropriate units (e.g., whole numbers, halves, quarters, or eighths).	No additional indicator(s) at this level. Mastery is expected at previous grade levels.
		MA 2.4.1.b Create and represent a data set by making a line plot.	MA 3.4.1.b Represent data using line plots where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.		

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.4.1 Representations: Students will create displays that represent data.	**MA 7.4.1 Representations:** Students will create displays that represent data.	**MA 8.4.1 Representations:** Students will create displays that represent data.	**MA 11.4.1 Representations:** Students will create displays that represent data.	**MA 12.4.1 Representations:** Students will create displays that represent data.
MA 6.4.1.a Represent data using line plots, dot plots, box plots, and histograms.	MA 7.4.1.a Represent data using circle graphs.	MA 8.4.1.a Represent bivariate data (i.e. ordered pairs) using scatter plots.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.4.2 Analysis & Applications: Students will analyze data to address the situation.	**MA 1.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 2.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 3.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 4.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 5.4.2 Analysis & Applications:** Students will analyze data to address the situation.
MA 0.4.2.a Identify, sort, and classify objects by size, shape, color, and other attributes. Identify objects that do not belong to a particular group and explain the reasoning used.	MA 1.4.2.a Ask and answer questions about the total number of data points, how many in each category, and compare categories by identifying how many more or less are in a particular category using a picture graph.	MA 2.4.2.a Interpret data using bar graphs with up to four categories. Solve simple comparison problems using information from the graphs.	MA 3.4.2.a Solve problems and make simple statements about quantity differences (e.g., how many more and how many less) using information represented in pictographs and bar graphs.	MA 4.4.2.a Solve problems involving addition or subtraction of fractions using information presented in line plots.	MA 5.4.2.a Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (e.g., frequency charts) and bar graphs.
					MA 5.4.2.b Formulate questions that can be addressed with data and make predictions about the data.

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.4.2 Analysis & Applications: Students will analyze data to address the situation.	**MA 7.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 8.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 11.4.2 Analysis & Applications:** Students will analyze data to address the situation.	**MA 12.4.2 Analysis & Applications:** Students will analyze data to address the situation.
MA 6.4.2.a Solve problems using information presented in line plots, dot plots, box plots, and histograms.	MA 7.4.2.a Solve problems using information presented in circle graphs.	MA 8.4.2.a Solve problems and make predictions using an approximate line of best fit.	MA 11.4.2.a Identify and compute measures of central tendency (mean, median, mode) when provided data both with and without technology.	MA 12.4.2.a (AT) Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
MA 6.4.2.b Compare and interpret data sets based upon their graphical representations (e.g., center, spread, and shape).	MA 7.4.2.b Explain the difference between a population and a sample.		MA 11.4.2.b Explain how transformations of data, including outliers, affect measures of central tendency.	
MA 6.4.2.c Find and interpret the mean, median, mode, and range for a set of data.	MA 7.4.2.c Generate conclusions about a population based upon a random sample.		MA 11.4.2.c Compare data sets and formulate conclusions.	
MA 6.4.2.d Compare the mean, median, mode, and range from two sets of data.	MA 7.4.2.d Determine and critique biases in different data representations.		MA 11.4.2.d Support conclusions with valid arguments.	
			MA 11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology.	
			MA 11.4.2.f Describe the shape, identify any outliers, and determine the spread of a data set.	

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
			MA 11.4.2.g Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.	
			MA 11.4.2.h Explain the differences between a randomized experiment and observational studies.	
			MA 11.4.2.i Using scatter plots, analyze patterns and describe relationships in paired data.	
			MA 11.4.2.j Recognize when arguments based on data confuse correlation with causation.	
			MA 11.4.2.k Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed.	

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.					
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MA 0.4.3 Probability: Students will interpret and apply concepts of probability.	**MA 1.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 2.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 3.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 4.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 5.4.3 Probability:** Students will interpret and apply concepts of probability.
No additional indicator(s) at this level.	No additional indicator(s) at this level.	No additional indicator(s) at this level.	No additional indicator(s) at this level.	No additional indicator(s) at this level.	No additional indicator(s) at this level.

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
Grade 6	Grade 7	Grade 8	Grades 9 – 11	Grade 12 Advanced Topics (AT)
MA 6.4.3 Probability: Students will interpret and apply concepts of probability.	**MA 7.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 8.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 11.4.3 Probability:** Students will interpret and apply concepts of probability.	**MA 12.4.3 Probability:** Students will interpret and apply concepts of probability.
No additional indicator(s) at this level.	MA 7.4.3.a Generate a list of possible outcomes for a simple event.	No additional indicator(s) at this level. Mastery is expected at previous grade levels.	MA 11.4.3.a Construct sample spaces and probability distributions.	MA 12.4.3.a (AT) Calculate the expected value of a random variable and interpret it as the mean of a probability distribution.
	MA 7.4.3.b Describe the theoretical probability of an event using a fraction, percentage, and decimal.		MA 11.4.3.b Use appropriate counting techniques to determine the probability of an event.	MA 12.4.3.b (AT) Determine possible outcomes of a decision by assigning probabilities to outcome values and finding expected values.
	MA 7.4.3.c Find theoretical probabilities for independent events.		MA 11.4.3.c Determine if events are mutually exclusive and calculate their probabilities in either case.	MA 12.4.3.c (AT) Evaluate and compare strategies on the basis of expected values.
	MA 7.4.3.d Perform simple experiments and express the degree of likelihood (possible, impossible, certain, more likely, equally likely, or less likely); write as fractions and percentages.			MA 12.4.3.d (AT) Analyze decisions and strategies using probability concepts (e.g., medical testing and product testing).
	MA 7.4.3.e Find experimental probability for independent events.			
	MA 7.4.3.f Compare and contrast theoretical and experimental probabilities.			
	MA 7.4.3.g Find the probability of dependent compound events.			

MA K-12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.				
	MA 7.4.3.h Identify complementary events and calculate their probabilities.			