

PK-5 Mathematics Matrix

K-12 Comprehensive Standard: Number								
Students will communicate number sense concepts using multiple representations to reason, solve problem, and make connections within mathematics and across disciplines.								
Concept	PK	Kindergarten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Integrated Math I <i>Sixth Grade</i>
Numeric Relationships	MA M PK.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	MA S 0.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	MA S 1.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	MA S 2.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.	MA S 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 S 4.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions and decimals within the base-ten number system.	MA S 5.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions and decimals within the base-ten number system.	MA S 6.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions, decimals, percents, and integers within the base-ten number system.
Curricular Indicators	<p>MA M PK.1.1.a Perform the counting sequence by counting forward from any given number to 20, by ones</p> <p>MA M PK.1.1.b Demonstrate cardinality (i.e., the last number name said indicates the number of objects counted) 1-10</p>	<p>MA S 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</p> <p>MA S 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</p>	<p>MA S 1.1.1.a Count to 120 by ones and tens, starting at any given number</p> <p>MA M 1.1.1.a Count to 200 by ones and tens starting from any given number and count to 100 by fives at any decade number</p>	<p>MA S 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</p>				

Curricular Indicators		MA M 0.1.1.b Read numerals within the range of 0 – 20	MA S 1.1.1.b Read and write numerals within the range of 0 – 120 MA M 1.1.1.b Read and write numerals within the range of 0 – 200	MA S 2.1.1.b Read and write numbers within the range of 0 – 1,000 using standard, word, and expanded forms	MA S 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 S 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 S 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 M 6.1.1.j Convert a fraction to a decimal using long division
	MA M PK.1.1.f Represent a number 0 to 10 using objects	MA S 0.1.1.f Write numbers 0 to 20 and represent a number of objects with a written numeral 0 to 20	MA S 1.1.1.c Write numerals to match a representation of a given set of objects for numbers up to 120					
	MA M PK.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 10	MA S 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						

Curricular Indicators	MA M PK.1.1.d Demonstrate the relationship between numbers, knowing each sequential number name refers to a quantity that is one larger within the range 0-10	MA M 0.1.1.d Demonstrate the relationship between numbers, knowing each sequential number name refers to a quantity that is one larger (e.g. before and after, one more and one less)	MA S 1.1.e Demonstrate that decade numbers represent a number of tens and ones (e.g., 50 = 5 tens and 0 ones)	MA M 2.1.1.d Demonstrate that 100 represents a group of ten tens (e.g. 100 more and 100 less)				
					MA S 3.1.1.c Round a whole number to the tens or hundreds place, using place value understanding or visual representation	MA S 4.1.1.g Round a multi-digit whole number to any given place	MA S 5.1.1.c Round whole numbers and decimals to any given place	
	MA M PK.1.1.e Count up to 10 objects arranged in a line. Count out the number of objects, given a number from 1 to 10. Begin to count scattered array of 10 objects	MA S 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 S 4.1.1.c Classify a number up to 100 as prime or composite		MA S 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents

Curricular Indicators						MA S 4.1.1.d Determine whether a given number up to 100 is multiple of a given one-digit number		
						MA S 4.1.1.e Determine factors of any whole number up to 100		
	MA M PK.1.1.h Compare the number of objects in two groups by identifying the comparison as more, less, or same (equal) to by using strategies of matching and counting	MA S 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 S 0.1.1.i Compare the value of two written numerals between 1 and 10	MA S 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 S 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 S 3.1.1.b Compare whole numbers through the hundred thousands and represent the comparisons using the symbols $>$, $<$ or $=$	MA S 4.1.1.f Compare whole numbers up to one million and decimals through the hundredths place using $>$, $<$, and $=$ symbols, and visual representations	MA S 5.1.1.b Compare whole numbers, fractions, mixed numbers, and decimals through the thousandths place and represent comparisons using symbols $<$, $>$, or $=$	MA S 6.1.1.c Compare and order rational numbers both on the number line and not on the number line

Curricular Indicators	MA M PK.1.1.g Begin to compose numbers from 11 to 19 using a 10 frame	MA S 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 S 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) and can be recorded as an equation (e.g., $19=10+9$)	MA S 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 S 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 S 5.1.1.e Write powers of 10 with exponents	MA S 6.1.1.b Represent numbers using exponential notation
					MA S 3.1.1.d Represent and understand a fraction as a number on a number line			
					MA S 3.1.1.e Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers			

Curricular Indicators					MA S 3.1.1.f Show and identify equivalent fractions using visual representations including pictures, manipulatives, and number lines	MA S 4.1.1.i Generate and explain equivalent fractions by multiplying by an equivalent fraction of 1		
					MA S 3.1.1.g Find parts of a whole and parts of a set using visual representations			
					MA S 3.1.1.h Explain and demonstrate how fractions $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and a whole relate to time, measurement, and money, and demonstrate using visual representation			
					MA S 3.1.1.i Compare and order fractions having the same numerators or denominators using visual representations, comparison symbols, and verbal reasoning	MA S 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 S 6.1.1.h Compare and order integers and absolute value both on the number line and not on the number line
						MA S 4.1.1.j Explain how to change a mixed number to a fraction and how to change a fraction to a mixed number		

Curricular Indicators						MA S 4.1.1.i 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 S 4.1.1.h Use decimals notation for fractions with denominators of 10 or 100		
							MA S 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 S 6.1.1.d Convert among fractions, decimals, and percents using multiple representations
								MA S 6.1.1.e Determine ratios from drawings, words, and manipulatives with the use of symbols
								MA S 6.1.1.f Convert unit rates
								MA S 6.1.1.g Model integers using drawings, words, manipulatives, number lines, and symbols

Curricular Indicators								MA S 6.1.1.i Determine absolute value of rational numbers
Operations	MA S PK.1.2 Operations: Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	MA S 0.1.2 Operations: Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	MA S 1.1.2 Operations: Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	MA S 2.1.2 Operations: Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.	MA S 3.1.2 Operations: Students will demonstrate the meaning of multiplication and division with whole numbers and compute accurately.	MA S 4.1.2 Operations: Students will demonstrate the meaning of addition and subtraction of whole numbers and fractions and compute accurately.	MA S 5.1.2 Operations: Students will demonstrate the meaning of operations and compute accurately with whole numbers, fractions, and decimals.	MA S 6.1.2 Operations: Students will compute with fractions and decimals accurately.
Curricular Indicators		MA S 0.1.2.a Fluently (i.e., automatic recall based on understanding) add and subtract within 5	MA S 1.1.2.a Fluently (i.e., automatic recall based on understanding) add and subtract within 10	MA S 2.1.2.a Fluently (i.e., automatic recall based on understanding) add and subtract within 20				
			MA S 1.1.2.b Add and subtract within 20, using a variety of strategies, (e.g., count on to make a ten).	MA S 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 S 4.1.2.a Add and subtract multi-digit numbers using the standard algorithm		

Curricular Indicators			MA S 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 S 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 S 3.1.2.a Add and subtract within 1,000 with or without regrouping		MA S 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 S 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 S 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 S 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 S 2.1.2.c Mentally add or subtract 10 or 100 to/from a given number 100-900				

Curricular Indicators				MA S 2.1.2.d Add up to three two-digit numbers using strategies based on place value and understanding of properties				
				MA S 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 S 3.1.2.c Use drawings, words, arrays, symbols, repeated addition, equal groups, and number lines to explain the meaning of multiplication			
					MA S 3.1.2.d Use words and symbols to explain the meaning of the Zero Property and Identity Property of multiplication			
					MA S 3.1.2.e Multiply one digit whole numbers by multiples of 10 in the range of 10 to 90			
					MA S 3.1.2.f Use objects, drawings, arrays, words and symbols to explain the relationship between multiplication and division (e.g., if $3 \times 4 = 12$ then $12 \div 3 = 4$)			

Curricular Indicators						MA S 4.1.2.b Multiply a four-digit whole number by a one-digit whole number		
						MA S 4.1.2.c Multiply a two-digit whole number by a two-digit whole number using the standard algorithm	MA S 5.1.2.a Multiply multi-digit whole numbers using the standard algorithm	
					MA S 3.1.2.g Fluently (i.e. automatic recall based on understanding) multiply and divide within 100	MA S 4.1.2.d Divide up to a four-digit whole number by a one-digit divisor with and without a remainders	MA S 5.1.2.b Divide four-digit whole numbers by a two-digit divisor with or without remainders using the standard algorithm	MA S 6.1.2.e Add, subtract, multiply, and divide decimals using the standard algorithm
						MA S 4.1.2.e Use drawings, words, and symbols to explain the meaning of addition and subtraction of fractions with like denominators		
						MA S 4.1.2.f Add and subtract fractions and mixed numbers with like denominators	MA S 5.1.2.h Add and subtract fractions and mixed numbers with unlike denominators	
						MA S 4.1.2.g Multiply a fraction by a whole number	MA S 5.1.2.c Multiply a whole number by a fraction or a fraction by a fraction using models and visual representations	MA S 6.1.2.a Multiply and divide fractions and mixed numbers

Curricular Indicators							MA S 5.1.2.d Divide a unit fraction by a whole number and a whole number by a unit fraction	MA S 6.1.2.d Divide multi-digit numbers using the standard algorithm
							MA S 5.1.2.e Explain division of a whole number by a fraction using models and visual representations	
							MA S 5.1.2.f Interpret a fraction as division of the numerator by the denominator	MA S 6.1.2.c Evaluate expressions with positive exponents
					MS S 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	MS S 4.1.2.h Determine the reasonableness of computations involving whole number products and quotients in real world problems using estimation, compatible numbers, mental computations, or other strategies	MA S 5.1.2.i Determine the reasonableness of computations involving whole numbers, fractions, and decimals	
							MA S 5.1.2.j Multiply and divide by powers of 10	
								MA S 6.1.2.b Convert between metric and standard units of measurement

<i>Curricular Indicators</i>								MA S 6.1.2.f Estimate and check reasonableness of answers using appropriate strategies and tools
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K-12 Comprehensive Standard: Algebra

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

Concept	PK	Kindergarten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Integrated Math I Sixth Grade
Algebraic Relationships	MA M PK.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 0.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 1.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 2.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 3.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 4.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 5.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 6.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.
Curricular Indicators	MA M PK.2.1.a Begin to decompose numbers less than or equal to 10 in more than one way, showing decomposition with a drawing, or manipulatives	MA S 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 S 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 S 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., $3 + n = 15$, $81 \div n = 9$)	MA S 5.2.1.a Form ordered pairs from a rule such as $y=2x$, and graph the ordered pairs on a coordinate plane	MA S 6.2.1.c Analyze the relationship between dependent and independent variables using graphs, tables and equations
				MA S 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 S 3.2.1.a Identify arithmetic patterns (including patterns in the addition or multiplication tables) using properties of operations		

Curricular Indicators		MA S 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 S 1.2.1.b Use the relationship of addition and subtraction to solve subtraction problems (e.g., find $12 - 9 = \underline{\quad}$, using the addition fact $9 + 3 = 12$)		MA S 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 S 6.2.1.a Create algebraic expressions (e.g., one operation, one variable as well as multiple operations, one variable) from word phrases
			MA S 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 S 1.2.1.d Determine the unknown whole number in an addition or subtraction equation, (e.g. $7 + ? = 13$)			MA S 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 S 6.2.1.b Recognize and generate equivalent algebraic expressions involving distributive property and combining like terms

Algebraic Processes	MA M PK.2.2 Algebraic Processes: Students will apply the operational properties when adding and subtracting.	MA S 0.2.2 Algebraic Processes: Students will apply the operational properties when adding and subtracting.	MA S 1.2.2 Algebraic Processes: Students will apply the operational properties when adding and subtracting.	MA S 2.2.2 Algebraic Processes: Students will apply the operational properties when adding and subtracting.	MA S 3.2.2 Algebraic Processes: Student will apply the operational properties when multiplying and dividing.	MA S 4.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations.	MA S 5.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations.	MA S 6.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations, inequalities, and
Curricular Indicators		No additional indicator(s) at this level	MA S 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 S 3.2.2.a Apply the commutative, associative, and distributive properties as strategies to multiply and divide	MA S 4.2.2.a Solve one- and two-step equations which use any or all of the four basic operations and include the use of a letter to represent the unknown quantity	MA S 5.2.2.a Interpret and evaluate numerical or algebraic expressions using order of operations (excluding exponents)	MA S 6.2.2.a Simplify expressions using the distributive property and combining like terms
			MA S 3.2.2.b Solve one-step whole number equations using the four operations, which include the use of a letter to represent the unknown quantity.		MA S 6.2.2.b Use substitution to determine if a given value for a variable makes an equation or inequality true			

Curricular Indicators								MA S 6.2.2.c Evaluate numerical expressions, including absolute value and exponents, with respect to order of operations
								MA S 6.2.2.d Given the value of the variable, evaluate algebraic expressions (which many include absolute value) with respect to order of operations (non-negative rational numbers)
								MA S 6.2.2.e Solve one-step equations with non-negative rational numbers using addition, subtraction, multiplication and division
								MA S 6.2.2.f Make tables of equivalent ratios relating quantities with whole-numbers and find missing values in the tables, and plot the pairs of values on the coordinate plane
								MA S 6.2.2.g Represent inequalities on a number line, e.g., graph $x > 3$

Applications	MA M PK.2.3 Applications: Students will solve real world problems involving addition and subtraction.	MA S 0.2.3 Applications: Students will solve real world problems involving addition and subtraction.	MA S 1.2.3 Applications: Students will solve real world problems involving addition and subtraction.	MA S 2.2.3 Applications: Students will solve real world problems involving addition and subtraction.	MA S 3.2.3 Applications: Students will solve real world problems involving equations with whole numbers.	MA S 4.2.3 Applications: Students will solve real world problems involving equations with fractions.	MA S 5.2.3 Applications: Students will solve real world problems involving equations with fractions and mixed numbers.	MA S 6.2.3 Applications: Students will solve real world problems involving ratios, unit rates, and percents.
Curricular Indicators	MA M PK.2.3.a Solve real world problems that involve addition and subtraction within 10 (e.g., by using objects or drawings to represent the problem)	MA S 0.2.3.a Solve real world problems that involve addition and subtraction within 10 (e.g., by using objects or drawings to represent the problem)	MA S 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 S 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 S 3.2.3.a Solve real world problems involving two-step equations (involving two operations) involving whole numbers using addition and subtraction	MA S 4.2.3.a Solve real world problems involving multi-step equations comprised of whole numbers using the four operations, including interpreting remainders		MA S 6.2.3.a Write equations (e.g., one operation, one variable) to represent real-life problems comprised of non-negative rational numbers
			MA S 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 S 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 S 3.2.3.b Write an equation (e.g., one operation, one variable) to represent real world problems involving whole numbers	MA S 4.2.3.b Solve real world problems involving addition and subtraction of fractions and mixed numbers with like denominators	MA S 5.2.3.a Solve real world problems involving addition and subtraction of fractions and mixed numbers with like and unlike denominators	MA S 6.2.3.b Solve real world problems comprised of non-negative rational numbers

Curricular Indicators			MA S 1.2.3.c Create a real world problem to represent a given equation involving addition and subtraction within 20					MA S 6.2.3.c Solve real-life problems involving percents of numbers
								MA S 6.2.3.d Solve real-life problems using ratios and unit rates

K-12 Comprehensive Standard: Geometry

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

Concept	PK	Kindergarten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Integrated Math I Sixth Grade
Characteristics	MA M PK.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 0.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 1.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 2.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 3.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 4.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 5.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 6.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.
Curricular Indicators	MA M PK.3.1.a Begin to describe real world objects using names of shapes, regardless of their orientation or size (squares, circle, triangles, rectangles, hexagons, cubes, cones, spheres, and cylinders)	MA S 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 S 1.3.1.a Determine defining and non-defining attributes of two-dimensional shapes; build and draw shapes that match the given definition	MA S 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 S 3.3.1.a Identify the number of sides, angles, and vertices of two-dimensional shapes	MA S 4.3.1.a Recognize angles as geometric shapes that are formed where two rays share a common endpoint	MA S 5.3.1.a Identify three-dimensional figures including cubes, cones, pyramids, prisms, spheres, and cylinders	MA S 6.3.1.a Identify and create nets to represent two-dimensional drawings of rectangular prisms and triangular prisms
	MA M PK.3.1.b Begin to identify shapes as two-dimensional (“flat”) or three-dimensional (“solid”)	MA S 0.3.1.b Identify shapes as two-dimensional (“flat”) or three-dimensional (“solid”)	MA S 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 S 3.3.1.b Sort quadrilaterals into categories (e.g., rhombuses, squares, and rectangles)	MA S 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 S 5.3.1.c Justify the classification of two-dimensional figures based on their properties	

Curricular Indicators				MA S 2.3.1.b Partition a rectangle into rows and columns of equal sized squares. Count to find the total.				
			MA S 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”, “fourth of”, and “quarter of”	MA S 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, third of, fourth of	MA S 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 S 4.3.1.b Classify an angle as acute, obtuse, or right		
	MA M PK.3.1.c Compare two- and three-dimensional shapes, with different sizes and orientations, to describe their similarities, and differences	MA S 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 “corner”/vertices), and other attributes (e.g., sides of equal length)					MA S 5.3.1.b Identify faces, edges, and vertices of rectangular prisms	
						MA S 4.3.1.c Identify and draw points, lines, line segments, rays, angles, parallel lines, perpendicular lines, intersecting lines, and recognize them in two-dimensional figures		

Curricular Indicators	MA M PK.3.1.d Model shapes found in real-life by building shapes from materials (e.g., clay and pipe cleaners) and drawing shapes	MA S 0.3.1.d Model shapes found in real world by building shapes from materials (e.g., clay and pipe cleaners) and drawing shapes						
	MA M PK.3.1.e Match models to combine simple shapes to compose larger shapes (e.g., pattern blocks)	MA S 0.3.1.e Combine simple shapes to compose larger shapes (e.g., use triangle pattern blocks to build a hexagon)						
				MA S 2.3.1.d Recognize the equal shares of identical wholes need not have the same shape				
						MA S 4.3.1.e Identify right triangles		
						MA S 4.3.1.f Measure angles in whole number degrees using a protractor		
						MA S 4.3.1.g Sketch angles of a specified measure		
						MA S 4.3.1.h Recognize and draw lines of symmetry in two-dimensional shapes		

Coordinate Geometry	MA M PK.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 0.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 1.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 2.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 3.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 4.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 5.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 6.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.
Curricular Indicators	MA M PK .3.2.a Describe the relative positions of objects (e.g., above, below, beside, in front of, behind, next to, between)	MA S 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 S 5.3.2.a Identify the origin, x axis, and y axis of the coordinate plane	MA S 6.3.2.a Identify the ordered pair of a given point in the coordinate plane
							MA S 5.3.2.b Graph and name points in the first quadrant of the coordinate plane using ordered pairs of whole numbers	MA S 6.3.2.b Plot the location of an ordered pair in the coordinate plane
								MA S 6.3.2.e Calculate vertical and horizontal distances in the coordinate plane to find perimeter and area
								MA S 6.3.2.d Draw polygons in the coordinate plane given coordinates for the vertices
								MA S 6.3.2.c Identify the quadrant of a given point in the coordinate plane

Measurement	MA M PK.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 0.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 1.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 2.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 3.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 4.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 5.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 6.3.3 Measurement: Students will perform and compare measurements and apply formulas.
Curricular Indicators			MA S 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 S 2.3.3.a Solve real world problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately				
					MA S 3.3.3.a Find the perimeter of polygons given the side lengths, and find an unknown side length	MA S 4.3.3.a Apply perimeter and area formulas for rectangles		
			MA S 1.3.3.b Tell and write time to the half hour and hour using analog and digital clocks	MA S 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 S 3.3.3.b Tell and write time to the minute using both analog and digital clocks			

Curricular Indicators					MA S 3.3.3.c Solve real world problems involving addition and subtraction of time intervals and elapsed time			
	MA M PK.3.3.a Describe measurable attributes of real-life objects, e.g., length or weight	MA S 0.3.3.a Describe measurable attributes of real world objects, e.g., length or weight	MA S 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 S 2.3.3.c Identify and use appropriate tools for measuring length (e.g., ruler, yardstick, meter stick, and measuring tape)	MA S 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 S 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 S 5.3.3.a Recognize that solid figures have volume that is measured in cubic units	MA S 6.3.3.a Determine the area of quadrilaterals, including parallelograms and trapezoids, and triangles by composition and decomposition of polygons as well as application of formula
	MA M PK 3.3.b Compare length and weight of two objects (e.g., longer/shorter, heavier/lighter)	MA S 0.3.3.b Compare length and weight of two objects (e.g., longer/shorter, heavier/lighter)	MA S 1.3.3.d Order three objects by directly comparing their lengths, or indirectly by using a third object	MA S 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 S 3.3.3.f Use concrete and pictorial models to measure areas in square units by counting square units		MA S 5.3.3.b Use concrete to measure the volume of rectangular prisms in cubic units by counting cubic units	MA S 6.3.3.b Determine the surface area of rectangular prisms and triangular prisms using nets
								MA S 6.3.3.c Use concrete and pictorial models to measure the volume of right rectangular prisms
				MA S 2.3.3.e Measure and estimate lengths using, inches, feet, centimeters, and meters	MA S 3.3.3.e Estimate and measure length to the nearest half inch, quarter inch, and centimeter	MA S 4.3.3.c Generate simple conversions from a larger unit to a smaller unit within the customary and metric systems of measurement	MA S 5.3.3.c Generate conversions within the customary and metric systems of measurement	

Curricular Indicators				MA S 2.3.3.f Compare the difference in length of objects using, inches and feet or centimeters and meters.				
				MA S 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 S 2.3.3.h Use measurement lengths and addition and subtraction within 100 to solve real-world problems				
					MA S 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 S 6.3.3.3.g Apply volume, formulas for right rectangular prisms

<i>Curricular Indicators</i>					MA S 3.3.3.h Identify and draw rectangles with the same perimeter and different areas or with the same area and different perimeters			
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K-12 Comprehensive Standard: Data

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

Concept	PK	Kindergarten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Integrated Math I <i>Sixth Grade</i>
Representations	MA M PK.4.1 Representations: Students will create displays that represent the data.	MA S 0.4.1 Representations: Students will create displays that represent the data.	MA S 1.4.1 Representations: Students will create displays that represent the data.	MA S 2.4.1 Representations: Students will create displays that represent the data.	MA S 3.4.1 Representations: Students will create displays that represent the data.	MA S 4.4.1 Representations: Students will create displays that represent the data.	MA S 5.4.1 Representations: Students will create displays that represent the data.	MA S 6.4.1 Representations: Students will create displays that represent the data.
Curricular Indicators	MA M PK.4.1.a Begin to represent data to organize and represent a data set with up to three categories	MA M 0.4.1.a Organize and represent a data set with up to three categories	MA S 1.4.1.a Organize and represent a data set with up to three categories using a picture graph MA M 1.4.1.a Organize, represent, and explain data set with up to three categories	MA S 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 S 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 M 3.4.1.a Create graphs (pictographs, bar graphs, and line graphs) to represent a data set—including data collected through observations, surveys, and experiments—with several categories			
				MA S 2.4.1.b Create and represent a data set by making a line plot	MA S 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 S 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 S 6.4.1.a Represent data using line plots (dot plots), box plots, and histograms

Analysis & Application	MA M PK.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 0.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 1.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 2.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 3.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 4.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 5.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 6.4.2 Analysis & Applications: Students will analyze data to address the situation.
Curricular Indicators			MA S 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 S 2.4.2.a Interpret data using bar graphs with up to four categories. Solve simple comparison problems using information from the graphs		MA S 4.4.2.a Solve problems involving addition or subtraction of fractions using information presented in line plots	MA S 5.4.2.b Formulate questions that can be addressed with data and make predictions about the data	MA S 6.4.2.a Use operations with fractions to solve problems using information presented in line plots
	MA M PK.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 S 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 S 3.4.2.a Solve problems and make simple statements about quantity differences (e.g., how many more and how many less) using information in pictographs and bar graphs			

Curricular Indicators							MA S 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 S 6.4.2.b Compare and interpret data sets based upon their graphical representations (center, spread and shape)
								MA S 6.4.2.c Find and interpret the mean, median, mode, and range for a set of data
								MA S 6.4.2.d Compare the mean, median, mode, and range from two sets of data
Probability	MA M PK .4.3 Probability: Students will interpret and apply concepts of probability.	MA S 0.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 1.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 2.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 3.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 4.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 5.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 6.4.3 Probability: Students will interpret and apply concepts of probability.
Curricular Indicators	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	No additional indicator(s) at this level	No additional indicator(s) at this level
Course	PK Mathematics	Kindergarten Mathematics	First Grade Mathematics	Second Grade Mathematics	Third Grade Mathematics	Fourth Grade Mathematics	Fifth Grade Mathematics	Integrated Math I Sixth Grade
Materials	Building Blocks (McGraw Hill 2013)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Big Ideas Math: A Bridge to Success Course 1 (Houghton Mifflin Harcourt, 2014)

6-11 Mathematics Matrix

K-12 Comprehensive Standard: Number

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

Concept	Fifth Grade	Integrated Math I	Integrated Math II	Integrated Math III	Algebra I	Geometry	Algebra II
Numeric Relationships	MA S 5.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among fractions and decimals and within the base-ten number system.	MA S 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 S 7.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among rational numbers within the base-ten number system.	MA S 8.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.	MA M 9.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.	MA M 10.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.	MA S 11.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.
Curricular Indicators	MA S 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 M 6.1.1.j Convert a fraction to a decimal using long division	No additional indicator(s) at this level. Mastery is expected at previous grade levels	MA S 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 M 9.1.1.a Compare and contrast subsets of the complex number system, including rational, irrational, integers, whole, and natural numbers		MA S 11.1.1.a Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers
		MA S 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents					
	MA S 5.1.1.e Write powers of 10 with exponents	MA S 6.1.1.b Represent non-negative whole numbers using exponential notation	MA M 7.1.1.a Compare and represent numbers in scientific and standard notation	MA S 8.1.1.b Represent numbers using positive and negative exponents and in scientific notation			

Curricular Indicators	MA S 5.1.1.b Compare whole numbers, fractions, mixed numbers, and decimals through the thousandths place and represent comparisons using symbols $<$, $>$, or $=$	MA S 6.1.1.c Compare and order rational numbers both on the number line and not on the number line	MA M 7.1.1.b Compare and order real numbers on the number line and not on a number line	MA S 8.1.1.c Describe the difference between a rational and irrational number			
	MA S 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 S 6.1.1.d Convert among fractions, decimals, and percents using multiple representations		MA S 8.1.1.d Approximate, compare, and order real numbers (both rational and irrational) and order real numbers both on and off the number line			
	MA S 5.1.1.c Round whole numbers and decimals to any given place				MA S 11.1.1.b 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 S 6.1.1.e Determine ratios from drawings, words, and manipulatives					
		MA S 6.1.1.f Explain and determine unit rates					

Curricular Indicators		MA S 6.1.1.g Model integers using drawings, words, manipulatives, number lines, and symbols					
		MA S 6.1.1.h Compare and order integers and absolute value both on the number line and not on the number line					
		MA S 6.1.1.i Determine absolute value of rational numbers					
							MA S 11.1.1.b Recognize that closure properties apply to the subsets of the complex number system, under the standard operations
Operations	MA S 5.1.2 Operations: Students will demonstrate the meaning of the operations with decimals and compute whole numbers by a fraction accurately.	MA S 6.1.2 Operations: Students will compute with fractions and decimals accurately.	MA S 7.1.2 Operations: Students will compute with rational numbers accurately.	MA S 8.1.2 Operations: Students will compute with exponents and roots.	MA S 11.1.2 Operations: Students will compute with real and complex numbers.	MA S 11.1.2 Operations: Students will compute with real and complex numbers.	MA S 11.1.2 Operations: Students will compute with real and complex numbers.
Curricular Indicators	MA S 5.1.2.a Multiply multi-digit whole numbers using the standard algorithm						
	MA S 5.1.2.c Multiply a whole number by a fraction or a fraction by a fraction using models and visual representations	MA S 6.1.2.a Multiply and divide non-negative fractions and mixed numbers	MA S 7.1.2.b Add, subtract, multiply, and divide rational numbers (e.g., positive and negative fractions, decimals, and integers).	MA M 8.1.2.f Compute rational, integers, whole and natural numbers	MA M 9.1.2.a Compute rational, irrational, integers, whole and natural numbers		MA S 11.1.2.a Compute with subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers

Curricular Indicators			MA S 7.1.2.a Solve problems using proportions and ratios (e.g., cross products, percents, tables, equations, and graphs)	MA S 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 S 5.1.2.b Divide four-digit whole numbers by a two-digit divisor with or without remainders using the standard algorithm	MA S 6.1.2.d Add, subtract, multiply, and divide decimals using the standard algorithm	MA S 7.1.2.d Use multiple representations and strategies to add, subtract, multiply, and divide integers				
	MA S 5.1.2.f Interpret a fraction as division of the numerator by the denominator	MA S 6.1.2.b Evaluate expressions with positive exponents	MA S 7.1.2.c Apply properties of operations as strategies for problem solving with rational numbers	MA S 8.1.2.b Simplify numerical expressions involving exponents and roots, e.g., 4^{-2} is the same as $1/16$	MA S 11.1.2.b Simplify expressions with rational exponents		MA S 11.1.2.b Simplify expressions with rational exponents
	MA S 5.1.2.d Divide a unit fraction by a whole number and a whole number by a unit fraction	MA S 6.1.2.c Divide multi-digit numbers using the standard algorithm					
	MA S 5.1.2.e Explain division of a whole number by a fraction using models and visual representations						
		MA S 6.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.	MA S 7.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools	MA S 8.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools	MA S 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 S 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 S 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

Curricular Indicators	MA S 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, and/or relationships between operations						
	MA S 5.1.2.h Add and subtract fractions and mixed numbers with unlike denominators						
	MA S 5.1.2.i Determine the reasonableness of computations involving whole numbers, fractions, and decimals						
	MA S 5.1.2.j Multiply and divide by powers of 10			MA S 8.1.2.d Multiply and divide numbers using scientific notation			MA S 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 S 8.1.2.c Simplify numerical expressions involving absolute value			

K-12 Comprehensive Standard: Algebra

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

Concept	Fifth Grade	Integrated Math I	Integrated Math II	Integrated Math III	Algebra I	Geometry	Algebra II
Algebraic Relationships	MA S 5.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.	MA S 6.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	MA S 7.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	MA S 8.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.	MA S 11.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with functions.		MA S 11.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with functions.
Curricular Indicators		MA S 6.2.1.a Create algebraic expressions (e.g., one operation, one variable as well as multiple operations, one variable) from word phrases	MA S 7.2.1.a Describe and create an inequality from words and pictures (e.g., one-step, one-variable)	MA S 8.2.1.a Create algebraic expressions, equations, and inequalities (e.g., two-step, one variable) from word phrases, tables, and pictures	MA S 11.2.1.a Define a function and use function notation		
		MA S 6.2.1.b Recognize and generate equivalent algebraic expressions involving distributive property and combining like terms		MA S 8.2.1.c Describe equations and linear graphs as having one solution, no solution, or infinitely many solutions	MA S 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation		MA S 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation
				MA S 8.2.1.b Determine and describe the rate of change for given situations through the use of tables and graphs	MA S 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither		MA S 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither
	MA S 5.2.1.a Form ordered pairs from a rule such as $y=2x$, and graph the ordered pairs on a coordinate plane	MA S 6.2.1.c Represent and analyze the relationship between two variables using graphs, tables and one-step equations			MA S 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form		MA S 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form

Curricular Indicators			MA S 7.2.1.b Represent <u>real world situations with proportions</u>	MA S 8.2.1.d Graph proportional relationships <u>and interpret</u> the slope	MA S 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 S 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 M 9.2.1.f Analyze and graph absolute value functions (using a table of values)		MA S 11.2.1.f Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using piecewise definition)
					MA S 11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums)		MA S 11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums)
							MA S 11.2.1.h Represent, interpret, and analyze inverses of functions algebraically and graphically
Algebraic Processes	MA S 5.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations.	MA S 6.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations, and inequalities.	MA S 7.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations, and inequalities.	MA S 8.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations, and inequalities.	MA S 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities.		MA S 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities.

Curricular Indicators	MA S 5.2.2.a Interpret and evaluate numerical or algebraic expressions using order of operations (excluding exponents)	MA S 6.2.2.a Simplify expressions using the distributive property and combining like terms	MA S 7.2.2.a Solve equations using the distributive property and combining like terms	MA S 8.2.2.a Solve multi-step equations involving rational numbers with the same variable appearing on both sides of the equal sign	MA S 11.2.2.b Identify and explain the properties used in solving equations and inequalities		MA S 11.2.2.b Identify and explain the properties used in solving equations and inequalities
		MA S 6.2.2.b Use substitution to determine if a given value for a variable makes an equation or inequality true	MA S 7.2.2.b Use factoring and properties of operations to create equivalent algebraic expressions. [e.g., $2x + 6 = 2(x + 3)$]		MA S 11.2.2.c Simplify algebraic expressions involving integer and rational exponents		MA S 11.2.2.c Simplify algebraic expressions involving integer and rational exponents
					MA M 9.2.2.d Perform operations on rational expressions with a monomial denominators and numerators (add, subtract, multiply, divide, and simplify)		MA S 11.2.2.d Perform operations on rational expressions (add, subtract, multiply, divide, and simplify)
		MA S 6.2.2.c Evaluate numerical expressions, including absolute value and exponents, with respect to order of operations	MA S 7.2.2.c Given the value of the variable(s), evaluate algebraic expressions (including absolute value)				
		MA S 6.2.2.d Given the value of the variable, evaluate algebraic expressions (which many include absolute value) with respect to order of operations (non-negative rational numbers)			MA S 11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value)		
		MA S 6.2.2.e Solve one-step equations with non-negative rational numbers using addition, subtraction, multiplication and division	MA S 7.2.2.d Solve two-step equations involving rational numbers which include the integers		MA S 11.2.2.f Solve an equation involving several variables for one variable in terms of the others		

Curricular Indicators			MA S 7.2.2.e Solve one-step inequalities involving integers and rational numbers and represent solutions on a number line	MA S 8.2.2.b Solve two-step inequalities involving rational numbers and represent solutions on a number line	MA S 11.2.2.g Solve linear and absolute value equations and inequalities		
		MA S 6.2.2.f Use equivalent ratios relating quantities with whole-numbers and find missing values in the tables					
		MA S 6.2.2.g Represent inequalities on a number line, e.g., graph $x > 3$			MA S 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically		MA S 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically
					MA S 11.2.2.i Perform operations (addition, subtraction, multiplication, and division) on polynomials		MA S 11.2.2.i Perform operations (addition, subtraction, multiplication, and division) on
					MA S 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions		MA S 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions
					MA S 11.2.2.k Recognize polynomial multiplication patterns and their related factoring patterns (e.g., $(a + b)^2 = a^2 + 2ab + b^2$, $a^2 - b^2 = (a + b)(a - b)$)		

Curricular Indicators					MA S 11.2.2.1 Make the connection between the factors of a polynomial and the zeros of a polynomial		
							MA S 11.2.2.m Combine functions by composition and perform operations on functions (addition, subtraction, multiplication, division)
					MA M 9.2.2.m Solve quadratic equations involving real numbers		MA S 11.2.2.n Solve quadratic equations involving real coefficients and real or imaginary roots
					MA S 11.2.2.a Convert equivalent rates (e.g., miles per hour to feet per second)		
Applications	MA S 5.2.3 Applications: Students will solve real-life problems involving equations with fractions and mixed numbers.	MA S 6.2.3 Applications: Students will solve real world problems involving ratios, unit rates, and percents.	MA S 7.2.3 Applications: Students will solve real world problems involving expressions, equations, and inequalities.	MA S 8.2.3 Applications: Students will solve real world problems involving multi-step equations and multi-step inequalities.	MA S 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 S 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.

Curricular Indicators	MA S 5.2.3.a Solve real-life problems using equations involving fractions and mixed numbers using addition and subtraction	MA S 6.2.3.a Write equations (e.g., one operation, one variable) to represent real-life problems comprised of non-negative rational numbers	MA S 7.2.3.a Describe and write linear equations from words and tables	MA S 8.2.3.a Describe and write equations from words, patterns, and tables	MA S 11.2.3.a Analyze, model, and solve real-life problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions)		MA S 11.2.3.a Analyze, model, and solve real-life problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions)
	MA S 5.2.3.b Solve real-life problems involving addition and subtraction of fractions and mixed numbers with unlike denominators	MA S 6.2.3.b Solve real-life problems involving non-negative rational numbers	MA S 7.2.3.b Write a two-step equation to represent real world problems involving rational numbers in any form	MA S 8.2.3.b Write an equation to represent real-life problems comprised of rational numbers in any form (whole numbers, fractions, and decimals)			
		MA S 6.2.3.c Solve real-life problems involving percents of numbers	MA S 7.2.3.c Solve real world problems with equations that involve rational numbers in any form	MA S 8.2.3.c Solve real-life multi-step problems comprised of rational numbers in any form (whole numbers, fractions, and decimals)			
		MA S 6.2.3.d Solve real-life problems using ratios and unit rates	MA S 7.2.3.d Solve real world problems comprised of inequalities				
			MA S 7.2.3.e Use proportional relationships to solve real-life problems, including percent problems, (e.g., % increase, % decrease, mark-up, tip)				

K-12 Comprehensive Standard: Geometry

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

Concept	Fifth Grade	Integrated Math I	Integrated Math II	Integrated Math III	Algebra I	Geometry	Algebra II
Characteristics	MA S 5.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 6.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 7.3.1 Characteristics: Students will identify and describe geometric characteristics and create two-dimensional shapes.	MA S 8.3.1 Characteristics: Students will identify and describe geometric characteristics and create two-dimensional shapes.	MA S 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.	MA S 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.
Curricular Indicators	MA S 5.3.1.a Identify three-dimensional figures	MA S 6.3.1.a Identify and create nets to represent two-dimensional drawings of prisms, pyramids, cylinders and cones			MA M 9.3.1.a Know and use precise definitions based on the undefined terms of perpendicular lines and parallel lines	MA M 10.3.1.a Know and use precise definitions of ray, line segment, angle, and congruence based on the defined terms of geometry: point, line and plane	
	MA S 5.3.1.b Justify the classification of two-dimensional figures based on their properties			MA S 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 S 11.3.1.b Prove geometric theorems about angles, triangles, congruent triangles, similar triangles, parallel lines with transversals, and quadrilaterals using deductive reasoning	
						MA S 11.3.1.c Apply geometric properties to solve problems involving similar triangles, congruent triangles, quadrilaterals, and other polygons	

Curricular Indicators	MA S 5.3.1.c Identify faces, edges, and vertices of rectangular prisms						
			MA S 7.3.1.a Apply and use properties of adjacent, complementary, supplementary, and vertical angles to find missing angle measures	MA S 8.3.1.a Determine and use the relationships of the interior angles of a triangle to solve for missing measures			
						MA S 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 S 11.3.1.e Create geometric models to visualize, describe, and solve problems using similar triangles, right triangles, and trigonometry	
						MA S 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 S 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	

Curricular Indicators			MA S 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 S 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 M 7.3.1.c Notice when the conditions determine a unique triangle, more than one triangle, or no triangle				
						MA M 10.3.1.b (AT) Prove and apply properties of lengths of chords, secant segments, and tangent segments	
Coordinate Geometry	MA S 5.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 6.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 7.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 8.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.
Curricular Indicators	MA S 5.3.2.a Identify the origin, x axis, and y axis of the coordinate plane	MA S 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 S 11.3.2.a Derive and apply the midpoint formula	
	MA S 5.3.2.b Graph and name points in the first quadrant of the coordinate plane using ordered pairs of whole numbers	MA S 6.3.2.b Plot the location of an ordered pair in the coordinate plane			MA S 11.3.2.b Use coordinate geometry to analyze linear relationships to determine if lines are parallel or perpendicular		

Curricular Indicators					MA S 11.3.2.c Given a line, write the equation of a line that is parallel or perpendicular to it		
		MA S 6.3.2.e Calculate vertical and horizontal distances in the coordinate plane to find perimeter and area				MA S 11.3.2.d Derive and apply the distance formula	
		MA S 6.3.2.d Draw polygons in the coordinate plane given coordinates for the vertices				MA S 11.3.2.e Use coordinate geometry to prove triangles are right, acute, obtuse, isosceles, equilateral, or scalene	
						MA S 11.3.2.f Use coordinate geometry to prove quadrilaterals are trapezoids, isosceles trapezoids, parallelograms, rectangles, rhombi, kites, or squares	
		MA S 6.3.2.c Identify the quadrant of a given point in the coordinate plane		MA S 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 S 11.3.2.g Perform and describe positions and orientation of shapes under a single translation using algebraic notation on a coordinate plane	
				MA S 8.3.2.b Find congruent two-dimensional figures and define congruence in terms of a series of transformations		MA S 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	

Curricular Indicators						MA S 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 S 8.3.2.c Find similar two-dimensional figures and define similarity in terms of a series of transformations		MA S 11.3.2.j Perform and describe positions and orientation of shapes under a single dilation on a coordinate plane	
						MA S 11.3.2.k Derive the equation of a circle given the radius and the center	
Measurement	MA S 5.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 6.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 7.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 8.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 8.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 11.3.3 Measurement: Students will perform and compare measurements and apply formulas.	MA S 11.3.3 Measurement: Students will perform and compare measurements and apply formulas.
Curricular Indicators	MA S 5.3.3.a Recognize that solid figures have volume that is measured in cubic units	MA S 6.3.3.a Determine the area of quadrilaterals, including parallelograms and trapezoids, and triangles by composition and decomposition of polygons as well as application of formulas	MA S 7.3.3.a Solve real world problems involving perimeter and area of composite shapes made from triangles, quadrilaterals and polygons				
	MA S 5.3.3.d Generate conversions within a system of measurement including smaller to larger units					MA S 11.3.3.a Convert between various units of length, area and volume (e.g., such as square feet to square yards)	
							MA S 11.3.3.b Convert between metric and standard units of measurement

Curricular Indicators				MA S 8.3.3.a Explain a model of the Pythagorean Theorem			
	MA S 5.3.3.b Use concrete and pictorial models to measure the volume of rectangular prisms in cubic units by counting cubic units	MA S 6.3.3.b Determine the surface area of rectangular prisms and triangular prisms using nets	MA S 7.3.3.b Solve real world problems involving surface area and volume of composite shapes made from rectangular and triangular prisms	MA S 8.3.3.b Apply the Pythagorean Theorem to find missing side lengths and to solve real world problems		MA S 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 S 8.3.3.c Find the distance between any two points on the coordinate plane using the Pythagorean Theorem			
	MA S 5.3.3.c Apply volume formulas for right rectangular prisms		MA S 7.3.3.c Determine the area and circumference of circles both on and off the coordinate plane			MA S 11.3.3.d Find arc length and area of sectors of a circle	
		MA S 6.3.3.c Apply volume formulas for right rectangular prisms		MA S 8.3.3.d Determine the volume of cones, cylinders, and spheres, and solve real-world problems using volumes		MA S 11.3.3.e Determine surface area and volume of spheres, cones, pyramids, and prisms using formulas and appropriate units	

K-12 Comprehensive Standard: Data

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

Concept	Fifth Grade	Integrated Math I	Integrated Math II	Integrated Math III	Algebra I	Geometry	Algebra II
Representations	MA S 5.4.1 Representations: Students will create displays that represent the data.	MA S 6.4.1 Representations: Students will create displays that represent the data.	MA S 7.4.1 Representations: Students will create displays that represent the data.	MA S 8.4.1 Representations: Students will create displays that represent the data.	MA S 11.4.1 Representations: Students will create displays that represent the data.	MA S 11.4.1 Representations: Students will create displays that represent the data.	MA S 11.4.1 Representations: Students will create displays that represent the data.
Curricular Indicators		MA S 6.4.1.a Represent data using line plots (dot plots), box plots, and histograms	MA S 7.4.1.a Represent data using circle graphs	MA S 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		
Analysis & Applications	MA S 5.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 6.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 7.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 8.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 11.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 11.4.2 Analysis & Applications: Students will analyze data to address the situation.	MA S 11.4.2 Analysis & Applications: Students will analyze data to address the situation.
Curricular Indicators	MA S 5.4.2.a Formulate questions that can be addressed with data and make predictions about the data. Use observations, surveys, and experiments to collect, represent, and interpret the data using tables and bar graphs	MA S 6.4.2.a Solve problems using information presented in line plots, dot plots, box plots, and histograms	MA S 7.4.2.a Solve problems using information presented in circle graphs	MA S 8.4.2.a Solve problems and make predictions using an approximate line of best fit			MA S 11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology
		MA S 6.4.2.b Compare and interpret data sets based upon their graphical representations (center, spread and shape)					MA S 11.4.2.f Describe the shape, identify any outliers, and determine the spread of a data set

Curricular Indicators		MA S 6.4.2.c Find and interpret the mean, median, mode, and range for a set of data					MA S 11.4.2.b Explain how transformations of data, including outliers, affect measures of central tendency
		MA S 6.4.2.d Compare the mean, median, mode, and range from two sets of data					MA S 11.4.2.a Identify and compute measures of central tendency (mean, median, mode) when provided data both with and without technology
							MS S 11.4.2.c Compare data sets and formulate conclusions
			MA S 7.4.2.b Explain the difference between a population and a sample				MA S 11.4.2.d Support conclusions with valid arguments
			MA S 7.4.2.c Generate conclusions about a population based upon a random sample				MA S 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 S 7.4.2.d Determine and critique biases in different data representations				MA S 11.4.2.h Explain the differences between a randomized experiment and observational studies
							MA S 11.4.2.i Using scatter plots, analyze patterns and describe relationships in paired data
							MA S 11.4.2.j Recognize when arguments based on data confuse correlation with causation

Curricular Indicators							MA S 11.4.2.k Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed
Probability	MA S 5.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 6.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 7.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 8.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 11.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 11.4.3 Probability: Students will interpret and apply concepts of probability.	MA S 11.4.3 Probability: Students will interpret and apply concepts of probability.
Curricular Indicators		No additional indicator(s) at this level	MA S 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 S 11.4.3.a Construct sample spaces and probability distributions		
			MA S 7.4.3.b Describe the theoretical probability of an event using a fraction, percentage, decimal				
			MA S 7.4.3.c Find theoretical probabilities for independent events				
			MA S 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 S 7.4.3.e Find experimental probability for independent events		MA M 9.4.3.d Identify dependent and independent events and calculate their probabilities		

Curricular Indicators			MA S 7.4.3.f Compare and contrast theoretical and experimental probabilities.				
			MA S 7.4.3.g Find the probability of dependent compound events		MA S 11.4.3.b Use the appropriate counting techniques to determine the probability of an event		
			MA S 7.4.3.h Identify complementary events and calculate their probabilities		MA S 11.4.3.c Determine if events are mutually exclusive and calculate their probabilities in either case		

Course	Fifth Grade Mathematics	Integrated Math I	Integrated Math II	Integrated Math III	Algebra I	Geometry	Algebra II
Primary Materials	Math Expressions (Houghton Mifflin Harcourt 2011/2018) Saxon Mathematics (Houghton Mifflin Harcourt) CORE Program (Cather & Disney)	Big Ideas Math: A Bridge to Success Course 1 (Houghton Mifflin Harcourt, 2014)	Big Ideas Math: A Bridge to Success Course 2 Accelerated (Houghton Mifflin Harcourt, 2014)	Big Ideas Math: A Bridge to Success Course 3 (Houghton Mifflin Harcourt, 2014)	MPS Teacher Created Digital Textbook Algebra 1 Concepts and Skills (current resource, 2008) Alg I: Foundations 1 & Alg I/Geo: Foundations 2 Geometry 1 Concepts and Skills (current resource, 2008) Alg I/Geo: Foundations 2	MPS Teacher Created Digital Textbook Geometry 1 Concepts and Skills (current resource, 2008) Alg I/Geo: Foundations 2 & Geo/Alg II: Foundations 3 Algebra 2 Concepts and Skills (current resource, 2010) Geo/Alg II: Foundations 3	MPS Teacher Created Digital Textbook Algebra 2 Concepts and Skills (current resource, 2010) Alg II: Foundations 4

ADVANCED MATHEMATICS TOPICS MATRIX

K-12 Comprehensive Standard: Number				
Students will communicate number concepts using multiple representations to reason, solve problems, and make connections within Mathematics and across disciplines.				
Concept	College Algebra	Honors/ Precalculus	AP Calculus	AP Statistics
Numeric Relationships	MA S 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 S 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 S 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 S 12.1 Number: Students will communicate number sense concepts using multiple representations to reason, solve problems, and Make connections within Mathematics and across disciplines.
<i>Curricular Indicators</i>	MA S.12.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among the complex numbers	MA S.12.1.1 Numeric Relationships: Students will demonstrate, represent, and show relationships among the complex numbers		
		MA S 12.1.1.a (AT) Graph complex numbers on the complex plane		
		MA S 12.1.1.b (AT) Determine the magnitude of complex numbers		
	MA S 12.1.1.c (AT) Use Matrices to represent and manipulate data	MA S 12.1.1.c (AT) Use Matrices to represent and manipulate data		
	MA S 12.1.1.d (AT) Recognize the role that additive and multiplicative identities play in matrix operations	MA S 12.1.1.d (AT) Recognize the role that additive and multiplicative identities play in matrix operations		
	MA S 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 S 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		

<i>Curricular Indicators</i>		MA S 12.1.1.f (AT) Derive and use the formulas for the general term and summation of finite arithmetic and geometric series	MA M 12.1.1.a (AT) Derive and use the formulas for the general term and summation of geometric series	
Numeric Relationships	MA S 12.1.2 Operations: Students will compute with Matrices.	MA S 12.1.2 Operations: Students will compute with Matrices.		
<i>Curricular Indicators</i>	MA S 12.1.2.a (AT) Multiply Matrices by scalars to produce new Matrices.	MA S 12.1.2.a (AT) Multiply Matrices by scalars to produce new Matrices.		
	MA S 12.1.2.b (AT) Add, subtract, and multiply Matrices of appropriate dimensions.	MA S 12.1.2.b (AT) Add, subtract, and multiply Matrices of appropriate dimensions.		

K-12 Comprehensive Standard: Algebra

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

Concept	College Algebra	Honors/Precalculus	AP Calculus	AP Statistics
Algebraic Relationships	MA S 12.2 Algebra: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and Make connections within Mathematics and across disciplines.	MA S 12.2 Algebra: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and Make connections within Mathematics and across disciplines.	MA S 12.2 Algebra: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and Make connections within Mathematics and across disciplines.	MA S 12.2 Algebra: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and Make connections within Mathematics and across disciplines.
Curricular Indicators	MA M 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear functions	MA S 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions	MA S 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions	
	MA M 12.2.1.a (AT) Analyze and graph non-linear functions, e.g., quadratic, square root, logarithmic, rational, higher-order polynomials, absolute value, and piecewise	MA S 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 S 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 S 12.2.1.c (AT) Evaluate sine, cosine, and tangent functions at positive and negative multiples of 30 and 45 degrees		
		MA S 12.2.1.d (AT) Create new functions out of existing functions using addition, subtraction, multiplication, division, translation, dilation, and composition		
		MA S 12.2.1.b (AT) Use the unit circle to define the trigonometric functions on all real numbers		
		MA S 12.2.1.e (AT) Use limits to describe the behavior of a function near its asymptotes and removable discontinuities	MA S 12.2.1.e (AT) Use limits to describe the behavior of a function near its asymptotes and removable discontinuities	

<i>Curricular Indicators</i>		MA S 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 S 12.2.1.g (AT) Convert between radian and degree measures of an angle		
		MA M 12.2.1.h Use arc length and angular velocity formulas		
Algebraic Processes		MA S 12.2.2 Algebraic Processes: Students will apply the identities when evaluating and solving trigonometric equations.	MA S 12.2.2 Algebraic Processes: Students will apply the identities when evaluating and solving trigonometric equations.	
<i>Curricular Indicators</i>		MA S 12.2.2.a (AT) Use trigonometric identities to solve trigonometric equations	MA S 12.2.2.a (AT) Use trigonometric identities to solve trigonometric equations	
		MA M 12.2.2.b Prove trigonometric identities		
		MA S 12.2.2.b (AT) Explain symmetry (odd and even) and periodicity of trigonometric functions		
		MA S 12.2.2.c (AT) Create an invertible function from a non-invertible function by restricting the domain (e.g., arcsin, arcos, and arctan)		
		MA S 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		

Algebraic Applications		MA S 12.2.3 Applications: Students will solve real-life problems involving trigonometric functions.	MA S 12.2.3 Applications: Students will solve real-life problems involving trigonometric functions.	
<i>Curricular Indicators</i>		MA S 12.2.3.a (AT) Model periodic events with specified amplitude, frequency, and shifts		
		MA S 12.2.3.b (AT) Solve real world problems using trigonometric and inverse trigonometric functions		

K-12 Comprehensive Standard: Geometry

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

Concept	College Algebra	Honors/ Precalculus	AP Calculus	AP Statistics
Characteristics		MA S 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 S 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.	
Curricular Indicators		MA S 12.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes	MA S 12.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes	
		MA S 12.3.1.a (AT) Apply the Law of Sines and the Law of Cosines to find unknown measures in triangles		
		MA M 12.3.1.b Apply the six trigonometric ratios to solve right triangles		
Coordinate Geometry	MA S 12.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 12.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	MA S 12.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.	
Curricular Indicators		MA S 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 S 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 S 12.3.2.c (AT) Recognize that vector quantities have both Magnitude and direction and can be represented by directed line segments		

<i>Curricular Indicators</i>		MA S 12.3.2.d (AT) Add and subtract vectors graphically and algebraically		
		MA S 12.3.2.e (AT) Perform scalar multiplication of a vector and show it graphically		
		MA M 12.3.2.g (AT) Find the dot product of two vectors		
	MA S 12.3.2.f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters	MA S 12.3.2. f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters		
			MA S 12.3.2. g (AT) Determine the three-dimensional object created by rotating or revolving a two-dimensional object about an axis	
			MA S 12.3.2.h (AT) Determine the shape of a two-dimensional cross-section of a three-dimensional object	
		MA M 12.3.2.i Use trigonometric form to perform operations on complex numbers		
		MA M 12.3.2.j Convert coordinates and equations between rectangular and polar form		
Measurement			MA S 12.3.3 Measurement: Students will perform and compare measurements and apply formulas.	
<i>Curricular Indicators</i>			MA S 12.3.3.a (AT) Use Cavalieri's Principle to determine the volume of a sphere and other solid figures	
				MA S 12.3.3.a (AT) Determine the tolerance interval and percent of error in measurement

K-12 Comprehensive Standard: Data

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

Concept	College Algebra	Honors/ Precalculus	AP Calculus	AP Statistics
Characteristics				MA S 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.
Representations				MA S 12.4.1 Representations: Students will create displays that represent the data.
<i>Curricular Indicators</i>				No additional indicator(s) at this level. Mastery is expected at previous grade levels.
Analysis & Applications				MA S 12.4.2 Analysis & Applications: Students will analyze data to address the situation
<i>Curricular Indicators</i>				MA S 12.4.2.a (AT) Make inferences and justify conclusions from sample surveys, experiments, and observational studies
Probability				MA S 12.4.3 Probability: Students will interpret and apply concepts of probability.
<i>Curricular Indicators</i>				MA S 12.4.3.a (AT) Calculate the expected value of a random variable and interpret it as the mean of a probability distribution
				MA S 12.4.3.b (AT) Determine possible outcomes of a decision by assigning probabilities to outcome values and finding expected values
				MA S 12.4.3.c (AT) Evaluate and compare strategies on the basis of expected values
				MA S 12.4.3.d (AT) Analyze decisions and strategies using probability concepts, e.g., medical testing and product testing

<i>Course</i>	College Algebra	Honors/ Precalculus	AP Calculus	AP Statistics
<i>Primary Materials</i>	Algebra & Trigonometry, 10 th Edition (Pearson, 2016)	PreCalculus: Graphical, Numerical, Algebraic, 9 th Edition (Pearson 2015)	Calculus Early Transcendentals, 13 th Edition (Pearson, 2014)	Stats Modeling the World, 5 th Edition (Pearson, 2015)

Advanced Topics Specialized Concepts and Skills Students will investigate specialized concepts and skills derived from Calculus and Statistics.		
Specialized Concepts and Skills	AP Calculus	AP Statistics
	MA M 12.5 Students will investigate specialized concepts and skills derived from Calculus and Statistics.	MA M 12.5 Students will investigate specialized concepts and skills derived from Calculus and Statistics.
	MA M 12.5.1 Communicate calculus concepts using a multi-representational approach with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally.	MA M 12.5.2 Apply major statistical concepts and tools to collect, analyze, and draw conclusions from data
<i>Curricular Indicators</i>	MA M 12.5.1.a (AT) Analyze an assortment of functions by describing their asymptotic behavior, continuity, and limits at various functional values	MA M 12.5.2.a (AT) Demonstrate understanding of graphical and numerical techniques to study patterns and departures from patterns, with emphasis on interpreting graphical and numerical displays and summaries
	MA M 12.5.1.b (AT) Demonstrate relationships between functions and their derivatives	MA M 12.5.2.b (AT) Collect data according to a well-developed plan, deciding upon a method of data collections and analysis
	MA M 12.5.1.c (AT) Calculate, interpret and apply Riemann sums to the definite integral	MA M 12.5.2.c (AT) Utilize probability as a tool for anticipating what the distribution of data should look like under a given model
	MA M 12.5.1.d (AT) Interpret the convergence and divergence of series (BC only)	MA M 12.5.2.d (AT) Apply statistical inference for selecting models and drawing conclusions for the data