Shenendehowa Essential Content and Competencies Mathematics

Grades 5 to Algebra

Part 1 – Content Strands
Part 2 - Process Strands

Mathematics Essential Content and Competencies

Kindergarten through Algebra

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
Number Sense and Operations	**Number Sense and Operations**	**Number Sense and Operations**	**Number Sense and Operations**	**Number Sense and Operations**
5.N.1 Read and write whole numbers to millions	6.N.1 Read and write whole numbers to trillions			
SHEN 5.N.A Read number words to millions and write number words to ten thousand				
5.N.3 Understand the place value structure of the base ten number system: 10 ones = 1 ten; 10 tens = 1 hundred; 10 hundreds = 1 thousand; 10 thousands = 1 ten thousand; 10 ten thousands = 1 hundred thousand; 10 hundred thousands = 1 million;				
SHEN 5.N.B Recognize the meaning of zero in the place value system (0 – 1,000,000)				
5.N.2 Compare and order numbers to millions				
5.N.24 Round numbers to the nearest hundredth and up to 10,000				
5.N.27 Justify the reasonableness of answers using estimation	6.N.27 Justify the reasonableness of answers using estimation	7.N.19 Justify the reasonableness of answers using estimation	8.N.6 Justify the reasonableness of answers using estimation	
	6.N.2 Define and identify the commutative and associative properties of addition and multiplication			
SHEN 5.N.E Use proper terminology for the identity properties	6.N.4 Define and identify the identity and inverse properties of addition and multiplication			
	6.N.5 Define and identify the zero property of multiplication			

Reference NYS Standards (March 2005)

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
	6.N.3 Define and identify the distributive property of multiplication over addition			A.N.1 Identify and apply the properties of real numbers (closure, commutative, associative, distributive, identity, inverse) *Note: Students do not need to identify groups and fields, but students should be engaged in the ideas*
	Add and subtract integers with and without the number line.	7.N.12 Add, subtract, multiply, divide integers	Integer review	
		7.N.13 Add and subtract two integers (with and without the use of a number line)		
5.N.16 Use a variety of strategies to multiply three-digit by three-digit numbers *Note: Multiplication by anything greater than a three-digit multiplier/ multiplicand should be done using technology*	Use a variety of strategies to multiply two digit by two digit numbers.			
5.N.17 Use a variety of strategies to divide three-digit numbers by one- and two-digit numbers *Note: Division by anything greater than a two-digit divisor should be done using technology.*				
5.N.18 Evaluate an arithmetic expression using order of operations including multiplication, division, addition, subtraction and parentheses	6.N.22 Evaluate numerical expressions using order of operations (may include exponents of 2 or 3)	7.N.11 Simplify expressions using order of operations *Note: expressions may include absolute value and/or integral exponents greater than 0*	8.N.2 Evaluate expressions with integral exponents	

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
	6.N.25 Evaluate expressions having exponents where the power is an exponent of 1, 2, or 3			
		7.N.2 Recognize the difference between rational and irrational numbers		
		7.N.15 Recognize and state the value of the square root of a perfect square (up to 225)		
		7.N.18 Identify the two consecutive whole numbers between which the square root of a non-perfect square whole number less than 225 lies (with and without the use of a number line)		
		7.N.16 Determine the square root of non-perfect squares using a calculator (to the nearest tenth)		A.N.2 Simplify radical terms (no variable in the radicand)
		7.N.17 Classify irrational numbers as non-repeating/non-terminating decimals		A.N.2 Simplify radical terms (no variable in the radicand)
				A.N.3 Perform the four arithmetic operations using like and unlike radical terms and express the result in simplest form
5.N.8 Read, write, and order decimals to thousandths	Read, write, and order decimals to thousandths using the number line.			
5.N.10 Compare decimals using <, >, or =				
SHEN 5.N.F Express decimals as an equivalent form of fractions to tenths, hundredths, and thousandths				

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.N.23 Use a variety of strategies to add, subtract, multiply, and divide decimals to thousandths				
5.N.26 Estimate sums differences, products, and quotients of decimals				
5.N.12 Recognize that some numbers are only divisible by one and themselves (prime) and others have multiple divisors (composite)	Review prime and composite numbers.			
5.N.13 Calculate multiples of a whole number and the least common multiple of two numbers	**7.N.9 Determine multiples and least common multiple of two or more numbers**.	7.N.9 Determine multiples and least common multiple of two or more numbers *Review for assessment*	LCM and GCF of two monomials	
5.N.14 Identify the factors of a given number	Review factors			
5.N.15 Find the common factors and the greatest common factor of two numbers	**7.N.8 Find the common factors and greatest common factor of two or more numbers**	7.N.8 Find the common factors and greatest common factor of two or more numbers *Review for assessment*	8.A.10 Factor algebraic expressions using the GCF	
	7.N.10 Determine the prime factorization of a given number and write in exponential form	7.N.10 Determine the prime factorization of a given number and write in exponential form *Review for assessment*		
5.N.4 Create equivalent fractions, given a fraction	Review equivalent fractions (multiplying by 1)			
5.N.19 Simplify fractions to lowest terms				

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.N.5 Compare and order fractions including unlike denominators (with and without the use of a number line) *Note: Commonly used fractions such as those that might be indicated on ruler, measuring cup, etc.*	6.N.15 Order rational numbers (including positive and negative)			
	6.N.23 Represent repeated multiplication in exponential form	7.N.4 Develop the laws of exponents for multiplication and division (using patterns)	8.N.1 Develop and apply the laws of exponents for multiplication and division	A.N.4 Understand and use scientific notation to compute products and quotients of numbers
	6.N.24 Represent exponential form as repeated multiplication			
		7.N.14 Develop a conceptual understanding of negative and zero exponents with a base of ten and relate to fractions and decimals		A.N.4 Understand and use scientific notation to compute products and quotients of numbers
		7.N.5 Write numbers in scientific notation (integral powers of 10)		A.N.4 Understand and use scientific notation to compute products and quotients of numbers
		7.N.6 Translate numbers from scientific notation into standard form		A.N.4 Understand and use scientific notation to compute products and quotients of numbers A.N.6 Evaluate expressions involving factorial(s), absolute value(s), and exponential expression(s)
		7.N.7 Compare numbers written in scientific notation		A.N.4 Understand and use scientific notation to compute products and quotients of numbers A.N.6 Evaluate expressions involving factorial(s), absolute value(s), and exponential expression(s)

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.N.9 Compare fractions using <, >, or = **with like and unlike denominators**	Introduce ≠	Review <, >, =, ≠		
5.N.20 Convert improper fractions to mixed numbers, and mixed numbers to improper fractions	6.N.18 Add, subtract, multiply, and divide mixed numbers with unlike denominators			
	6.N.20 Represent fractions as terminating or repeating decimals			
5.N.21 Use a variety of strategies to add and subtract fractions with common denominators	6.N.16 Add and subtract fractions with unlike denominators			
5.N.22 Add and subtract mixed numbers with common denominators				
	6.N.19 Identify the multiplicative inverse (reciprocal) of a number			
	6.N.17 Multiply and divide fractions with unlike denominators			
5.N.25 Estimate sums and differences of fractions with common denominators				
5.N.6 Understand the concept of ratio	6.N.6 Understand the concept of rate			
5.N.7 Express ratios in different forms	6.N.7 Express equivalent ratios as a proportion			

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.N.11 Understand that percent means part of 100, and write percents as fractions and decimals	6.N.11 Read, write, and identify percents of a whole (0 to 100%)	**8.N.3 Read, write, and identify percents less than 1% and greater than 100%**	8.N.3 Read, write, and identify percents less than 1% and greater than 100% *Review for assessment*	
	6.N.12 Solve percent problems involving percent, rate, and base 6.N.7 Express equivalent ratios as a proportion	**8.N.4 Apply percents to: tax, percent increase decrease, simple interest, sale price, commission, interest rates, gratuities**	8.N.4 Apply percents to: tax, percent increase decrease, simple interest, sale price, commission, interest rates, gratuities *Review for assessment*	A.N.5 Solve algebraic problems arising from situations that involve fractions, decimals, percents (decrease/increase and discount), and proportionality/direct variation
	6.N.26 Estimate a percent of quantity (0% to 100%)	**8.N.5 Estimate a percent of quantity, given an application**	8.N.5 Estimate a percent of quantity, given an application *Review for assessment*	
	6.N.21 Find multiple representations of rational numbers (fractions, decimals, and percents 0 to 100)			
	6.N.13 Define absolute value and determine the absolute value of rational numbers (including positive and negative)			A.N.6 Evaluate expressions involving factorial(s), absolute value(s), and exponential expression(s)
	6.N.14 Locate rational numbers on a number line (including positive and negative)	7.N.3 Place rational and irrational numbers (approximations) on a number line and justify placement of the numbers		
		7.N.1 Distinguish between the various subset of real numbers		
	6.N.8 Distinguish the difference between rate and ratio			
	6.N.9 Solve proportions using equivalent fractions			

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
	6.N.10 Verify the proportionality using the product of the means equals the product of the extremes			
				A.N.7 Determine the number of possible events, using counting techniques or the Fundamental Principle of Counting
				A.N.8 Determine the number of possible arrangements (permutations) of a list of items
Algebra	**Algebra**	**Algebra**	**Algebra**	
5.A.1 Define and use appropriate terminology when referring to constants, variables, and algebraic expressions				
5.A.2 Translate simple verbal expressions into algebraic expressions	6.A.1 Translate two-step verbal expressions into algebraic expressions	7.A.1 Translate two-step verbal expressions into algebraic expressions	8.A.2 Write verbal expressions that match given mathematical expressions	A.A.1 Translate a quantitative verbal phrase into an algebraic expression
				A.A.2 Write a verbal expression that matches a given mathematical expression
5.A.3 Substitute assigned values into variable expressions and evaluate using order of operations	6.A.2 Use substitution to evaluate algebraic expressions (exponents of one, two and three)			
				A.A.3 Distinguish the difference between an algebraic expression and an algebraic equation
				A.A.21Determine whether a given value is a solution to a given linear equation in one variable or linear inequality in one variable

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.A.4 Solve simple one-step equations using basic whole-number facts				
5.A.5 Solve and explain simple one-step equations using inverse operations involving whole numbers	**6.A.4 Solve and explain two-step equations involving whole numbers using inverse operations**	**7.A.4 Solve multi-step equations by combining like terms, using the distributive property, or moving variables to one side of the equation**	Solve equationsincluding two-step, combining like terms, distributive property, and variables on both sides.	A.A.22 Solve all types of linear equations in one variable
		Solve word problems algebraically using "Let" statements.		
				A.A.25 Solve equations involving fractional expressions *Note: Expressions which result in linear equations in one variable*
	6.A.5 Solve simple proportions within context			A.A.26 Solve algebraic proportions in one variable which result in linear or quadratic equations
				A.A.23 Solve literal equations for a given variable
		7.A.5 Solve one-step inequalities (positive coefficients only) (See 7.G.10)	**8.A.13 Solve multi-step inequalities and graph solution set on a number line** **8.A.14 Solve linear inequalities by combining like terms, distributive property, variables to one side (multiply, divide by a negative number)**	A.A.24 Solve linear inequalities in one variable
	6.A.3 Translate two-step verbal sentences into algebraic equations		8.A.1 Translate verbal sentences into algebraic inequalities	A.A.4 Translate verbal sentences into mathematical equations or inequalities
				A.A.5 Write algebraic equations or inequalities that represent a situation

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.A.6 Analyze and solve verbal problems whose solution requires solving a linear equation in one variable or linear inequality in one variable
				A.A.10 Solve systems of two linear equations in two variables algebraically (See A.G.7)
				A.A.7 Analyze and solve verbal problems whose solution requires solving systems of linear equations in two variables
			7.A.3 Identify a polynomial as an algebraic expression containing one or more terms	
			8.A.5 Use physical models to perform operations with polynomials (algebra tiles)	
			8.A.6 Multiply and divide monomials	A.A.12 Multiply and divide monomial expressions with a common base, using the properties of exponents *Note: Use integral exponents only.*
		7.A.2 Add and subtract monomials with exponents of one	8.A.7 Add and subtract polynomials (integer coefficients)	A.A.13 Add, subtract, and multiply monomials and polynomials
			8.A.8 Multiply a binomial by a monomial or a binomial (integer coefficients)	
			8.A.9 Divide a polynomial by a monomial (integer coefficients) *The degree of the denominator is less than or equal to the degree of the denominator*	A.A.14 Divide a polynomial by a monomial or binomial, where the quotient has no remainder
			8.A.10 Factor algebraic expressions using the GCF	

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
			8.A.11 Factor a trinomial in the form $ax^2 + bx + c$; a=1 and c having no more than three sets of factors	A.A.20 Factor algebraic expressions completely, including trinomials with a lead coefficient of one (after factoring a GCF)
			Identify and factor the difference or two perfect squares (introduce).	A.A.19 Identify and factor the difference of two perfect squares
				A.A.27 Understand and apply the multiplication property of zero to solve quadratic equations with integral coefficients and integral roots
				A.A.28 Understand the difference and connection between roots of a quadratic equation and factors of a quadratic expression
				A.A.26 Solve algebraic proportions in one variable which result in linear or quadratic equations
				A.A.8 Analyze and solve verbal problems that involve quadratic equations
				A.A.11 Solve a system of one linear and one quadratic equation in two variables, where only factoring is required
				A.A.9 Analyze and solve verbal problems that involve exponential growth and decay
				A.A.15 Find values of a variable for which an algebraic fraction is undefined

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.A.16 Simplify fractions with polynomials in the numerator and denominator by factoring both and renaming them to lowest terms
				A.A.17 Add or subtract fractional expressions with monomial or like binomial denominators
				A.A.18 Multiply and divide algebraic fractions and express the product or quotient in simplest form
		7.A.7 Draw the graphic representation of a pattern from an equation or from a table of data	8.A.15 Understand that numerical information can be represented in multiple ways: arithmetically, algebraically, and graphically	
			8.A.16 Find a set or ordered pairs to satisfy a given linear numerical pattern (expressed algebraically); then plot the ordered pairs and draw the line	
			8.A.3 Describe a situation involving relationships that matches a given graph	
			8.A.4 Create a graph given a description or an expression for a situation involving a linear or nonlinear relationship	
				A.A.29 Use set-builder notation and/or interval notation to illustrate the elements of a set, given the elements in roster form
				A.A.30 Find the complement of a subset of a given set, within a given universe

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.A.31 Find the intersection of sets (no more than three sets) and/or union of sets (no more than three sets)
5.A.7 Create and explain patterns and algebraic relationships (i.e.,2,4,6,8...) algebraically: 2n (doubling)		**7.A.9 Build a pattern to develop a rule determining the sum of the interior angles of polygons**	**8.A.19 Interpret multiple representations using equation, table of values, and graph**	
5.A.8 Create algebraic or geometric patterns using concrete objects or visual drawings (i.e., rotate and shade geometric shapes		**7.A.8 Create algebraic patterns using charts/tables, graphs, equations, and expressions**		
SHEN 5.A.D Analyze a pattern or a whole-number function that requires a multi-step process and state the rule, given a table or an input/output box (i.e. 2x + 1)		Write an equation (no functional notation) to represent the relationship of column a and column b in a table of values (linear only)	7.A.10 Write an equation to represent a function from a table of values	
			8.A.17 Define and use correct technology when referring to a function (domain and range)	
			8.A.18 Determine if a relation is a function	A.G.3.Determine when a relation is a function, by examining ordered pairs and inspecting graphs of relations
				A.G.4 Identify and graph linear, quadratic (parabolic), absolute value, and exponential functions
			8.A.12 Apply algebra to determine the measure of angles formed by or contained in parallel lines cut by a transversal and by intersecting lines	
Geometry	**Geometry**	**Geometry**	**Geometry**	**Geometry**

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.G.6 Classify triangles by properties of their angles and sides			7.G.5 Identify the right angle, hypotenuse, and legs of a right triangle	
			7.G.6 Explore the relationship between the lengths of the three sides of a right triangle to develop the Pythagorean Theorem	
			7.G.8 Use the Pythagorean Theorem to determine the unknown length of a side of a right triangle	
			7.G.9 Determine whether a given triangle is a right triangle by applying the Pythagorean Theorem and using a calculator	
5.G.7 Know that the sum of the interior angles of a triangle is 180 degrees				
5.G.8 Find a missing angle when given two angles of a triangle				
5.G.9 Identify pairs of congruent triangles 5.G.10 Identify corresponding parts of congruent triangles				
5.G.2 Identify pairs of similar triangles	6.G.1 Calculate the length of corresponding sides of similar triangles using proportional reasoning			
5.G.3 Identify the ratio of corresponding sides of similar triangles				
			8.G.1 Identify pairs of vertical angles as congruent	

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
			8.G.2 Identify pairs of supplementary and complementary angles	
			8.G.3 Calculate the missing angle in a supplementary and complementary pair	
			8.G.4 Determine angle pair relationships when given two parallel lines cut by a transversal	
			8.G.5 Calculate missing angle measurements given two parallel lines cut by a transversal (see 8.A.12)	
			8.G.6 Calculate missing angle measurements when given two intersecting lines and an angle	
SHEN 5.G.A Identify and name polygons, recognizing that their names are related to the number of sides and angles (triangle, trapezoid, quadrilateral, pentagon, rhombus, parallelogram, hexagon, and octagon) and be able to name the set that they belong to				
5.G.4 Classify quadrilaterals by properties of their angles and sides				
5.G.5 Know that the sum of the interior angles of a quadrilateral is 360 degrees			7.G.7 Find a missing angle when given angles of a quadrilateral	

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.M.8 Measure and draw angles using a protractor	**7.M.8 Draw central angles in a given circle using a protractor**	7.M.8 Draw central angles in a given circle using a protractor Review with application		
		7.G.3 Identify the two dimensional shapes that make up the faces and the bases of three dimensional shapes		
	6.G.4 Determine the volume of rectangular prisms by counting cubes and develop the formula	7.G.2 Calculate the volume of prisms and cylinders using a given formula and a calculator		
	6.G.5 Identify radius, diameter, chords and central angles of a circle			
	6.G.6 Understand the relationship between the diameter and radius			
	6.G.9 Understand the relationship between the circumference and the diameter of the circle (Π key and 3.1416)			
----------→	*6.G.7 Determine the area and circumference of a circle using the appropriate formula	7.G.1 Calculate the radius or diameter given the circumference or area of a circle		
	6.G.8 Calculate the area of a sector of a circle given the measure of the central angle and the radius of the circle			A.G.1 Find the area and/or perimeter of figures composed of polygons and circles or sectors of a circle *Note: Figures may include triangles, rectangles, squares, parallelograms, rhombuses, trapezoids, circles, semi-circles, quarter-circles, and regular polygons (perimeter only).*

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
		7.G.10 Graph the solution set of an inequality (positive coefficients only) on a number line. *See 7.A.5	**8.G.19 Graph the solution set of an inequality on a number line**	A.G.6 Graph linear inequalities
5.G.12 Identify and plot points in the first quadrant **5.G.13 Plot points to form basic geometric shapes (identify and classify)**	**6.G.10 Identify and plot points in all four quadrants**		**8.G.15 Graph a line using a table of values**	
			8.G.13 Determine slope of a line from graph and explain the meaning of slope-constant rate of change	
			8.G.14 Determine y-intercept of line from a graph and be able to explain y-intercept	
			8.G.16 Determine the equation of a line given slope and y-intercept	
			8.G.17 Graph a line from an equation in slope intercept form y=mx+b	
			8.G.18 Solve systems of equations graphically (only linear integral solutions) no vertical or horizontal lines	A.G.7 Graph and solve systems of linear equations and inequalities with rational coefficients in two variables (See A.A.10)
			8.G.20 Distinguish between linear and non-linear equations ($y = ax^2 + bx + c$; a=1 only)graphically	A.G.4 Identify and graph linear, quadratic (parabolic), absolute value, and exponential functions
			8.G.21 Recognize the characteristics of quadratics and tables, graphs, equations and situations	A.G.5 Investigate and generalize how changing the coefficients of a function affects its graph
5.A.6 Evaluate the perimeter formula for given input values	6.A.6 Evaluate formulas for given input values (circumference, area, volume, etc.)	7.A.6 Evaluate formulas for given input values (surface area, rate, and density problems)		

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.G.14 Calculate perimeter of basic geometric shapes drawn on a coordinate plane (rectangles and shapes composed of rectangles having sides with integer lengths and parallel to the axes)	**6.G.11 Calculate the area of basic polygons drawn on a coordinate plane (rectangles and shapes composed of rect. having sides with integer lengths)**			
	6.G.2 Determine the area of triangles and quadrilaterals and develop formulas	7.G.4 Determine the surface area of prisms and cylinders using a calculator and a variety of methods		A.G.1 Find the area and/or perimeter of figures composed of polygons and circles or sectors of a circle *Note: Figures may include triangles, rectangles, squares, parallelograms, rhombuses, trapezoids, circles, semi-circles, quarter-circles, and regular polygons (perimeter only)* A.G.2 Use formulas to calculate volume and surface area of rectangular solids and cylinders
5.G.1 Calculate the perimeter of regular and irregular polygons	6.G.3 Use a variety of strategies to find the area of reg. and irreg. polygons			A.G.1 Find the area and/or perimeter of figures composed of polygons and circles or sectors of a circle *Note: Figures may include triangles, rectangles, squares, parallelograms, rhombuses, trapezoids, circles, semi-circles, quarter-circles, and regular polygons (perimeter only)*
SHEN 5.G.D **Find the area of irregular polygons by counting the number of squares**				

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.G.11 Identify and draw **all** lines of symmetry of basic geometric shapes			8.G.7 Describe and identify transformations in planes (rotations, translations, reflections, dilations)	
			8.G.8 Draw image of figure rotations of 90 and 180 degrees	
			8.G.9 Draw image of figure under reflection given line	
			8.G.10 Draw image of figure under translation	
			8.G.11 Draw image of figure under dilation	
			8.G.12 Identify the properties preserved and not preserved under reflection, rotation, translation, dilation	
			8.G.0 Construct the following, using a straight edge and compass: segment congruent to segment, angle congruent to angle, perpendicular bisector, angle bisector	
Measurement	**Measurement**	**Measurement**	**Measurement**	
			8.M.1 Solve equations/proportions to convert to equivalent measurements	A.M.1 Calculate rates using appropriate units (e.g., rate of a space ship versus the rate of a snail)
		7.M.1 Calculate distance using a map scale		
	6.M.1 Measure capacity and calculate volume of a rectangular prism	7.M.2 Convert capacities and volumes w/in a given system		A.M.2 Solve problems involving conversions within measurement systems, given the relationship between the units
	6.M.2 Identify customary units of capacity			

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.M.1 Use a ruler to measure to the nearest inch, $\frac{1}{2}, \frac{1}{4}$, and $\frac{1}{8}$ inch	Review measurement in fraction unit.			
5.M.2 Identify customary equivalent units of length **(ex. 4 x ¼ inch = 1 inch, 2 x 1 x ¼ inch = ½ inch)**	6.M.3 Identify equivalent customary units of capacity	*7.M.3 Identify customary units of mass		
5.M.3 Measure to the nearest **millimeter**, centimeter, and **meter**				
	6.M.4 Identify metric units of capacity	*7.M. 3 Identify metric units of mass		
5.M.4 Identify equivalent metric units of length **(m, mm, cm, km)**	6.M.5 Identify equivalent metric units of capacity			
5.M.5 Convert measurement within a given system		7.M.4 Convert mass w/in a given system		A.M.2 Solve problems involving conversions within measurement systems, given the relationship between the units
		7.M.5 Calculate unit price using proportions		
		7.M.6 Compare unit prices		
		7.M.7 Convert money between different currencies with the use of an exchange rate table and calculator		A.M.2 Solve problems involving conversions within measurement systems, given the relationship between the units
5.M.6 Determine the tool and technique to measure with an appropriate level of precision: lengths and angles	6.M.6 Determine the tool and technique: capacity	7.M.9 Determine the tool and technique: mass		
		7.M.10 Identify the relationships between relative error and magnitude when dealing w/large numbers		A.M.3 Calculate the relative error in measuring square and cubic units, when there is an error in the linear measure

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.M.9 Determine personal references for customary units of length (i.e., your pace is approximately 3 feet, your height is approximately 5 feet, etc.)	6.M.9 Determine personal references for capacity	7.M.12 Determine personal references for mass		
5.M.10 Determine personal references for metric units of length				
5.M.11 Justify the reasonableness of estimates	6.M.8 Justify the reasonableness of estimates	7.M.13 Justify the reasonableness of the mass of an object		
5.M.7 Calculate elapsed time in hours and minutes				
	6.M.7 Estimate volume, area, and circumference	7.M.11 Estimate surface area		
Statistics and Probability	**Statistics and Probability**	**Statistics and Probability**	**Statistics and Probability**	**Statistics and Probability**
5.S.1 Collect and record data from a variety of sources (i.e., newspapers, magazines, polls, charts, and surveys)	**6.S.1 Develop the concept of sampling when collecting data from a population and decide the best method to collect data for a particular question**	7.S.1 Identify and collect data using a variety of methods		
				A.S.1 Categorize data as qualitative or quantitative
				A.S.2 Determine whether the data to be analyzed is univariate or bivariate
				A.S.3 Determine whether the collected data or display of data may be biased

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
	6.S.3 Construct Venn diagrams to sort data			A.A.29 Use set-builder notation and/or interval notation to illustrate the elements of a set, given the elements in roster form A.A.30 Find the complement of a subset of a given set, within a given universe A.A.31 Find the intersection of sets (no more than three sets) and/or union of sets (no more than three sets)
	7.S.2 Display data in a circle graph **7.S.3 Convert raw data into double bar graphs and double line graphs**			
	7.S.6 Read and interpret data represented graphically (pictograph, bar graph, histogram, line graph, double line/bar graphs or circle graphs)			
5.S.2 Display data in a line graph to show an increase or decrease over time	**6.S.4 Determine and justify the most appropriate graph to display a given set of data (pictograph, bar graph, line graph, histogram or circle graph)**			
5.S.4 Formulate conclusions and make predictions from graphs **(line, bar, and pictographs)**	6.S.7 Read and interpret graphs (include mean, median, mode, and range)			A.S.9 Analyze and interpret a frequency distribution table, cumulative frequency distribution table, and a box-and-whisker plot

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.S.10 Evaluate published reports and graphs that are based on data by considering: Experimental design, appropriateness of data analysis; and soundness of conclusions
	6.S.2 Record data in a frequency table			A.S.5 Construct a histogram, cumulative frequency histogram, and a box-and-whisker plot, given a set of data
				A.S.6 Understand how the 5 statistical summary (minimum, maximum, and 3 quartiles) is used to construct a box-and-whisker plot
				A.S.7 Create a scatter plot for bivariate data
				A.S.8 Construct manually a reasonable line of best fit for a scatter plot and determine the equation of that line
				A.S.17 Use a reasonable line of best fit to make prediction Involving interpolation or extrapolation
				A.S.12 Identify the relationship between the independent and dependent variables from a scatter plot (positive, negative or none)
	6.S.8 Justify predictions made from data			
		7.S.7 Identify and explain misleading statistics and graphs		A.S.15 Identify and describe sources of bias and its effect, drawing conclusions from data
	6.S.6 Determine the range for a given set of data			

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
	7.S.4 Calculate the range for a given set of data			
5.S.3 Calculate the mean* for a given set of data and use to describe a set of data **** median, mode***	6.S.5 Determine the mean, mode, and median for a given set of data			
		7.S.5 Select the appropriate measure of central tendency		A.S.4 Compare and contrast the appropriateness of different measures of central tendency for a given data set
				A.S. 16 Recognize how linear transformations of one-variable data affect the data's mean, median, mode and range
5.S.5 List the possible outcomes for a single-event experiment	**6.S.9 List possible outcomes for compound events**			A.S.19 Determine the number of elements in a sample space and the number of favorable events
5.S.6 Record experiment results using fractions/ratios		7.S.8 Interpret data to provide the basis for predictions and to establish experimental probabilities		A.S.21 Determine empirical probabilities based on specific sample data
5.S.7 Create a sample space and determine the probability of a single event, given a simple experiment (i.e., rolling a number cube)				
		7.S.9 Determine the validity of sampling methods to predict outcomes		
		7.S.10 Predict the outcome of an experiment		
		7.S.11 Design and conduct an experiment to test predictions		
		7.S.12 Compare actual results to predicted results		

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.S.18 Know the definition of conditional probability and use it to solve for probabilities in finite sample space
		6.S.10 Determine the probability of dependent events		A.S.22 Determine, based on calculated probability of a set of events , if: Some or all are equally likely to occur One is more likely to occur than another Whether or not an event is certain to happen or not to happen
		6.S.11 Determine the number of possible outcomes for a compound event by using the fundamental counting principle and use this to determine the probabilities of events when the outcomes have equal probability		A.N.7 Determine the number of possible events, using counting techniques or the Fundamental Principle of Counting A.S.20 Calculate the probability of an event and its complement
				A.S.23 Calculate the probability of : series of independent events series of dependent events 2 mutually exclusive events 2 events that are not mutually exclusive

Shenendehowa Essential Content and Competencies
Mathematics

Grades 5 to Algebra

Part 1 – Content Strands
Part 2 - Process Strands

Mathematics Essential Content and Competencies

Kindergarten through Algebra

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
Problem Solving	**Problem Solving**	**Problem Solving**	**Problem Solving**	**Problem Solving**
	6.PS.1 Know the difference between relevant and irrelevant information when solving problems	**7.**PS.1 Use a variety of strategies to understand new mathematical content and to develop more efficient methods	**8.**PS.1 Use a variety of strategies to understand new mathematical content and to develop more efficient methods	A.PS.1 Use a variety of problem solving strategies to understand new mathematical content
5.PS.2 Understand that some ways of representing a problem are more efficient than others	6.PS.2 Understand that some ways of representing a problem are more efficient than others	7.PS.2 Construct appropriate extensions to problem situations	8.PS.2 Construct appropriate extensions to problem situations	A.PS.2 Recognize and understand equivalent representations of a problem situation or a mathematical concept
5.PS.3 Interpret information correctly, identify the problem, and generate possible strategies and solutions	6.PS.3 Interpret information correctly, identify the problem, and generate possible strategies and solutions	7.PS.3 Understand and demonstrate how written symbols represent mathematical ideas	8.PS.3 Understand and demonstrate how written symbols represent mathematical ideas	A.PS.3 Observe and explain patterns to formulate generalizations and conjectures
5.PS.4 Act out or model with manipulatives activities involving mathematical content from literature	6.PS.4 Act out or model with manipulatives activities involving mathematical content from literature	7.PS.4 Observe patterns and formulate generalizations	8.PS.4 Observe patterns and formulate generalizations	A.PS.4 Use multiple representations to represent and explain problem situations (e.g., verbally, numerically, algebraically, graphically)
5.PS.5 Formulate problems and solutions from everyday situations	6.PS.5 Formulate problems and solutions from everyday situations	7.PS.5 Make conjectures from generalizations	8.PS.5 Make conjectures from generalizations	A.PS.5 Choose an effective approach to solve a problem from a variety of strategies (numeric, graphic, algebraic)
		7.PS.7 Understand that there is no one right way to solve mathematical problems but that different methods have advantages and disadvantages		
5.PS.6 Translate from a picture/diagram to a numeric expression	6.PS.6 Translate from a picture/diagram to a numeric expression	7.PS.6 Represent problem situations verbally, numerically, algebraically, and graphically	8.PS.6 Represent problem situations verbally, numerically, algebraically, and graphically	A.PS.6 Use a variety of strategies to extend solution methods to other problems
5.PS.7 Represent problem situations verbally, numerically, algebraically, and/or graphically	6.PS.7 Represent problem situations verbally, numerically, algebraically, and/or graphically	7.PS.7 Understand that there is no one right way to solve mathematical problems but that different methods have advantages and disadvantages		A.PS.7 Work in collaboration with others to propose, critique, evaluate, and value alternative approaches to problem solving

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.PS.10 Work in collaboration with others to solve problems	6.PS.10 Work in collaboration with others to solve problems	7.PS.11 Work in collaboration with others to solve problems	8.PS.11 Work in collaboration with others to solve problems	A.PS.7 Work in collaboration with others to propose, critique, evaluate, and value alternative approaches to problem solving
5.PS.8 Select an appropriate representation of a problem	6.PS.8 Select an appropriate representation of a problem	7.PS.8Understand how to break a complex problem into simpler parts or use a similar problem type to solve a problem	8.PS.7Understand how to break a complex problem into simpler parts or use a similar problem type to solve a problem	A.PS.8 Determine information required to solve a problem, choose methods for obtaining the information, and define parameters for acceptable solutions
5.PS.9 Understand the basic language of logic in mathematical situations (and, or, not)	6.PS.9 Understand the basic language of logic in mathematical situations (and, or, and not)	7.PS.9Work backwards from a solution. 7 PS.12 Interpret solutions within the given constraints of a problem 7 PS13 Set expectations and limits for possible solutions	8 PS.9 Work backwards to form a solution 8. PS.12 Interpret solutions within the given constraints of a problem	A.PS.9 Interpret solutions within the given constraints of a problem
		7.PS.10 Use proportionality to model problems	8.PS.10 Use proportionality to model problems	
		7.PS.17 Evaluate the relative efficiency of different representations and solution methods of a problem		A.PS.10 Evaluate the relative efficiency of different representations and solution methods of a problem
5.PS.11 Translate from a picture/diagram to a number or symbolic expression	6.PS.11 Translate from a picture/diagram to a number or symbolic expression			
5.PS.12 Use trial and error and the process of elimination to solve problems	6.PS.12 Use trial and error and the process of elimination to solve problems			
	6.PS.14 Analyze problems by observing patterns			
	6.PS.15 Make organized lists or charts to solve numerical problems	7.PS.15 Choose methods for obtaining required information	8.PS.15 Choose methods for obtaining required information	
5.PS.13 Model problems with pictures/diagrams or physical objects	6.PS.16 Discuss with peers to understand a problem situation	7.PS.16 Justify solution methods through logical argument	8.PS.16 Justify solution methods through logical argument	

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.PS.15 Make organized lists or charts to solve numerical problems	6.PS.17 Determine what information is needed to solve problem	7.PS.17 Evaluate the efficiency of different representations of a problem	8.PS.17 Evaluate the efficiency of different representations of a problem	
	6.PS.18 Determine the efficiency of different representations of a problem			
	6.PS.19 Differentiate between valid and invalid approaches			
5.PS.1 Know the difference between relevant and irrelevant information when solving problems	6.PS.20 Understand valid counterexamples			
5.PS.14 Analyze problems by observing patterns	6.PS.21 Explain the methods and reasoning behind the problem solving strategies used			
	6.PS.22 Discuss whether a solution is reasonable in the context of the original problem			
5.PS.18 Determine the efficiency of different representations of a problem 5.PS.21 Explain the methods and reasoning behind the problem solving strategies used	6.PS.23 Verify results of a problem			
5.PS.16 Discuss with peers to understand a problem situation				
5.PS.17 Determine what information is needed to solve problem				
5.PS.23 Verify results of a problem				

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.PS.19 Differentiate between valid and invalid approaches 5.PS.20 Understand valid counterexamples				
5.PS.22 Discuss whether a solution is reasonable in the context of the original problem				

Reasoning and Proof	Reasoning and Proof	Reasoning and Proof	Reasoning and Proof	Reasoning and Proof
5.RP.1 Recognize that mathematical ideas can be supported using a variety of strategies	6.RP.1 Recognize that mathematical ideas can be supported using a variety of strategies	7.RP.1 Recognize that mathematical ideas can be supported by a variety of strategies	8.RP.1 Recognize that mathematical ideas can be supported by a variety of strategies	A.RP.1Recognize that mathematical ideas can be supported by a variety of strategies
5.RP.2 Understand that mathematical statements can be justified, using models, facts and relationships to explain their thinking	6.RP.2 Understand that mathematical statements can be supported, using models, facts, and relationships to explain their thinking	7.RP.2 Use mathematical strategies to reach a conclusion		A.RP.2 Use mathematical strategies to reach a conclusion and provide supportive arguments for a conjecture
5.RP.3 Investigate conjectures, using arguments and appropriate mathematical terms	6.RP.3 Investigate conjectures, using arguments and appropriate mathematical terms		8.RP.3 Investigate conjectures in mathematical terms, using mathematical strategies to reach a conclusion	A.RP.4 Develop, verify, and explain an argument, using appropriate mathematical ideas and language
		7.RP.3 Evaluate conjectures by distinguishing relevant from irrelevant information to reach a conclusion or make appropriate estimates	8.RP.4 Evaluate conjectures by distinguishing relevant from irrelevant information to reach a conclusion or make appropriate estimates	A.RP.3 Recognize when an approximation is more appropriate than an exact answer
5.RP.4 Make and evaluate conjectures, using a variety of strategies	6.RP.4 Make and evaluate conjectures, using a variety of strategies	7.RP.4 Provide supportive arguments for conjectures	8.RP.5 Provide supportive arguments for conjectures	A.RP.4 Develop, verify, and explain an argument, using appropriate mathematical ideas and language
5.RP.5 Justify general claims or conjectures, using manipulatives, models, expressions, and mathematical relationships	6.RP.5 Justify general claims or conjectures, using manipulatives, models, expressions, and mathematical relationships	7.RP.5 Develop, verify, and explain an argument, using appropriate mathematical ideas and language	8.RP.7 Develop, verify, and explain an argument, using mathematical ideas and language	A.RP.6 Present correct mathematical arguments in a variety of forms

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.RP.6 Develop and explain an argument verbally, numerically, and/or graphically	6.RP.6 Develop and explain an argument verbally, numerically, algebraically, and/or graphically	7.RP.6 Support an argument by using a systematic approach to test more than one case	8.RP.8 Justify an argument by using a systematic approach	A.RP.6 Present correct mathematical arguments in a variety of forms
		7.RP.6 Support an argument by using a systematic approach to test more than one case		A.RP.8 Support an argument by using a systematic approach to test more than one case
5.RP.7 Verify claims other students make, using examples and counterexamples when appropriate	6.RP.7 Verify claims other students make, using examples and counterexamples when appropriate	7.RP.7 Devise ways to verify results or use counterexamples to refute incorrect statements	8.RP.9 Devise ways to verify results, using counterexamples and indirect proof	A.RP.7Evaluate written arguments for validity
5.RP.8 Justify an argument through examples/counterexamples and special cases	6.RP.8 Support an argument through examples/counterexamples and special cases	7.RP.7 Devise ways to verify results or use counterexamples to refute incorrect statements	8.RP.9 Devise ways to verify results, using counterexamples and indirect proof	A.RP.5 Construct logical arguments that verify claims or counterexamples that refute them
	6.RP.9 Devise ways to verify results	7.RP.7 Devise ways to verify results or use counterexamples to refute incorrect statements	8.RP.9 Devise ways to verify results, using counterexamples and indirect proof	A.RP.9 Devise ways to verify results or use counterexamples to refute incorrect statements
			8.RP.9 Devise ways to verify results, using counterexamples and indirect proof	
		7.RP.8 Apply inductive reasoning in making and supporting mathematical conjectures	8.RP.2 Understand that mathematical statements can be justified using inductive reasoning.	A.RP.12 Apply inductive reasoning in making and supporting mathematical conjectures
			8.RP.6 Justify general claims using inductive reasoning	A.RP.10 Extend specific results to more general cases
				A.RP.11 Use a Venn diagram to support a logical argument

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
Communication	**Communication**	**Communication**	**Communication**	**Communication**
Communication	**Communication**	**Communication**	**Communication**	**Communication**
5.CM.1 Provide an organized thought process that is correct, complete, coherent, and clear	6.CM.1 Provide an organized thought process that is correct, complete, coherent, and clear	7.CM.1 Provide a correct, complete, coherent, and clear rationale for thought process used in problem solving	8.CM.1 Provide a correct, complete, coherent, and clear rationale for thought process used in problem solving	
5.CM.2 Explain a rationale for strategy selection	6.CM.2 Explain a rationale for strategy selection	7.CM.2 Provide an organized argument which explains rationale for strategy selection	8.CM.2 Provide an organized argument which explains rationale for strategy selection	A.CM.1 Communicate verbally and in writing a correct, complete, coherent, and clear design (outline) and explanation for the steps used in solving a problem
5.CM.3 Organize and accurately label work	6.CM.3 Organize and accurately label work	7.CM.3 Organize and accurately label work	8.CM.3 Organize and accurately label work	A.CM.2 Use mathematical representations to communicate with appropriate accuracy, including numerical tables, formulas, functions, equations, charts, graphs, Venn diagrams, and other diagrams
5.CM.4 Share organized mathematical ideas through the manipulation of objects, numerical tables, drawings, pictures, charts, graphs, tables, diagrams, models, and symbols in written and verbal form	6.CM.4 Share organized mathematical ideas through the manipulation of objects, numerical tables, drawings, pictures, charts, graphs, tables, diagrams, models, and symbols in written and verbal form	7.CM.4 Share organized mathematical ideas through the manipulation of objects, numerical tables, drawings, pictures, charts, graphs, tables, diagrams, models and symbols in written and verbal form	8.CM.4 Share organized mathematical ideas through the manipulation of objects, numerical tables, drawings, pictures, charts, graphs, tables, diagrams, models and symbols in written and verbal form	A.CM.3 Present organized mathematical ideas with the use of appropriate standard notations, including the use of symbols and other representations when sharing an idea in verbal and written form
				A.CM.4 Explain relationships among different representations of a problem
5.CM.5 Answer clarifying questions from others	6.CM.5 Answer clarifying questions from others	7.CM.5 Answer clarifying questions from others	8.CM.5 Answer clarifying questions from others	A.CM.5 Communicate logical arguments clearly, showing why a result makes sense and why the reasoning is valid

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.CM.5 Answer clarifying questions from others	6.CM.5 Answer clarifying questions from others	7.CM.5 Answer clarifying questions from others	7.CM.5 Answer clarifying questions from others	A.CM.6 Support or reject arguments or questions raised by others about the correctness of mathematical work
5.CM.6 Understand mathematical solutions shared by other students	6.CM.6 Understand mathematical solutions shared by other students	7.CM.6 Analyze mathematical solutions shared by others	8.CM.6 Analyze mathematical solutions shared by others	A.CM.7 Read and listen for logical understanding of mathematical thinking shared by other students
5.CM.7 Raise questions that elicit, extend, or challenge others' thinking	6.CM.7 Raise questions that elicit, extend, or challenge others' thinking	7.CM.8 Formulate mathematical questions that elicit, extend, or challenge strategies, solutions, and/or conjectures of others	8.CM.8 Formulate mathematical questions that elicit, extend, or challenge strategies, solutions, and/or conjectures of others	A.CM.9 Formulate mathematical questions that elicit, extend, or challenge strategies, solutions, and/or conjectures of others
				A.CM.10 Use correct mathematical language in developing mathematical questions that elicit, extend, or challenge other students' conjectures
5.CM.8 Consider strategies used and solutions found by others in relation to their own work	6.CM.8 Consider strategies used and solutions found by others in relation to their own work	7.CM.7 Compare strategies used and solutions found by others in relation to their own work	8.CM.7 Compare strategies used and solutions found by others in relation to their own work	A.CM.8 Reflect on strategies of others in relation to one's own strategy
5.CM.9 Increase their use of mathematical vocabulary and language when communicating with others	6.CM.9 Increase their use of mathematical vocabulary and language when communicating with others	7.CM.9 Increase their use of mathematical vocabulary and language when communicating with others	8.CM.9 Increase their use of mathematical vocabulary and language when communicating with others	
5.CM.10 Use appropriate vocabulary when describing objects, relationships, mathematical solutions, and rationale	6.CM.10 Use appropriate vocabulary when describing objects, relationships, mathematical solutions, and rationale	7.CM.10 Use appropriate language, representations, and terminology when describing objects, relationships, mathematical solutions, and rationale	8.CM.10 Use appropriate language, representations, and terminology when describing objects, relationships, mathematical solutions, and rationale	A.CM.10 Use correct mathematical language in developing mathematical questions that elicit, extend, or challenge other students' conjectures
5.CM.11 Decode and comprehend mathematical visuals and symbols to construct meaning	6.CM.11 Decode and comprehend mathematical visuals and symbols to construct meaning			A.CM.11 Represent word problems using standard mathematical notation

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
				A.CM.12 Understand and use appropriate language, representations, and terminology when describing objects, relationships, mathematical solutions, and rationale
		7.CM.11 Draw conclusions about mathematical ideas through decoding, comprehension, and interpretation of mathematical visuals, symbols, and technical writing	7.CM.11 Draw conclusions about mathematical ideas through decoding, comprehension, and interpretation of mathematical visuals, symbols, and technical writing	A.CM.13 Draw conclusions about mathematical ideas through decoding, comprehension, and interpretation of mathematical visuals, symbols, and technical writing

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
Connections	**Connections**	**Connections**	**Connections**	**Connections**
5.CN.1 Understand and make connections and conjectures in their everyday experiences to mathematical ideas	6.CN.1 Understand and make connections and conjectures in their everyday experiences to mathematical ideas	7.CN.1 Understand and make connections among multiple representations of the same mathematical idea		A.CN.1 Understand and make connections among multiple representations of the same mathematical idea
5.CN.3 Connect and apply mathematical information to solve problems	6.CN.2 Explore and explain the relationship between mathematical ideas	7.CN.2 Recognize connections between subsets of mathematical ideas		A.CN.2 Understand the corresponding procedures for similar problems or mathematical concepts
5.CN.2 Explore and explain the relationship between mathematical ideas	6.CN.3 Connect and apply mathematical information to solve problems	7.CN.3 Connect and apply a variety of strategies to solve problems		A.CN.3 Model situations mathematically, using representations to draw conclusions and formulate new situations
5.CN.5 Model situations with objects and representations and be able to draw conclusions	6.CN.4 Understand multiple representations and how they are related	7.CN.4 Model situations mathematically, using representations to draw conclusions and formulate new situations		A.CN.4 Understand how concepts, procedures, and mathematical results in one area of mathematics can be used to solve problems in other areas of mathematics
5.CN.4 Understand multiple representations and how they are related	6.CN.5 Model situations with objects and representations and be able to draw conclusions	7.CN.5 Understand how concepts, procedures, and mathematical results in one area of mathematics can be used to solve problems in other areas of mathematics		A.CN.5 Understand how quantitative models connect to various physical models and representations
	6.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives	7.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives		A.CN.6 Recognize and apply mathematics to situations in the outside world
5.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives	6.CN.7 Apply mathematics to problem situations that develop outside of mathematics	7.CN.7 Apply mathematical ideas to problem situations that develop outside of mathematics		A.CN.7 Recognize and apply mathematical ideas to problem situations that develop outside of mathematics
	6.CN.8 Investigate the presence of mathematics in careers and areas of interest	7.CN.8 Investigate the presence of mathematics in careers and areas of interest		A.CN.8 Develop an appreciation for the historical development of mathematics

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
5.CN.7 Apply mathematics to problem situations that develop outside of mathematics 5.CN.8 Investigate the presence of mathematics in careers and areas of interest 5.CN.9 Recognize and apply mathematics to other disciplines and areas of interest	6.CN.9 Recognize and apply mathematics to other disciplines and areas of interest	7.CN.9 Recognize and apply mathematics to other disciplines, areas of interest, and societal issues		

Representation	Representation	Representation	Representation	Representation
5.R.1 Use physical objects, drawings, charts, tables, graphs, symbols, equations, and technology as representations	6.R.1 Use physical objects, drawings, charts, tables, graphs, symbols, equations, or objects created using technology as representations	7.R.1 Use physical objects, drawings, charts, tables, graphs, symbols, equations, or objects created using technology as representations	8.R.1 Use physical objects, drawings, charts, tables, graphs, symbols, equations, or objects created using technology as representations	A.R.1 Use physical objects, diagrams, charts, tables, graphs, symbols, equations, or objects created using technology as representations of mathematical concepts
5.R.2 Explain, describe, and defend mathematical ideas using representations	6.R.2 Explain, describe, and defend mathematical ideas using representations	7.R.2 Explain, describe, and defend mathematical ideas using representations	8.R.2 Explain, describe, and defend mathematical ideas using representations	A.R.3 Use representation as a tool for exploring and understanding mathematical ideas
5.R.3 Read, interpret, and extend external models	6.R.3 Read, interpret, and extend external models	7.R.3 Recognize, compare, and use an array of representational forms	8.R.3 Recognize, compare, and use an array of representational forms	A.R.2 Recognize, compare, and use an array of representational forms
5.R.4 Use standard and nonstandard representations with accuracy and detail	6.R.4 Use standard and nonstandard representations with accuracy and detail	7.R.5 Use standard and non-standard representations with accuracy and detail	8.R.5 Use standard and non-standard representations with accuracy and detail	A.R.4 Select appropriate representations to solve problem situations
5.R.5 Use models to explore problem situations	6.R.5 Use representations to explore problem situations	7.R.6 Use representations to explore problem situations	8.R.6 Use models to explore problem situations	A.R.4 Select appropriate representations to solve problem situations
		7.R.4 Explain how different representations express the same relationship	8.R.4 Explain how different representations express the same relationship	
5.R.6 Investigate relationships between different representations and their impact on a given problem	6.R.6 Investigate relationships between different representations and their impact on a given problem	7.R.7 Investigate relationships between different representations and their impact on a given problem	8.R.7 Investigate relationships between different representations and their impact on a given problem	A.R.5 Investigate relationships between different representations and their impact on a given problem

Grade 5	Grade 6	Grade 7	Grade 8	Algebra
		7.R.8 Use representation as a tool for exploring and understanding mathematical ideas	8.R.8 Use representation as a tool for exploring and understanding mathematical ideas	A.R.4 Select appropriate representations to solve problem situations
5.R.7 Use mathematics to show and understand physical phenomena (i.e., determine the perimeter of a bulletin board)	6.R.7 Use mathematics to show and understand physical phenomena (e.g., determine the perimeter of a bulletin board)	7.R.9 Use mathematics to show and understand physical phenomena (e.g., make and interpret scale drawings of figures or scale models of objects)	8.R.9 Use mathematics to show and understand physical phenomena (e.g., make and interpret scale drawings of figures or scale models of objects)	A.R.6 Use mathematics to show and understand physical phenomena (e.g., find the height of a building if a ladder of a given length forms a given angle of elevation with the ground)
5.R.8 Use mathematics to show and understand social phenomena (i.e., construct tables to organize data showing book sales)	6.R.8 Use mathematics to show and understand social phenomena (e.g., construct tables to organize data showing book sales)	7.R.10Use mathematics to show and understand social phenomena (e.g., determine profit from sale of yearbooks)	8.R.10 Use mathematics to show and understand social phenomena (e.g., determine profit from sale of yearbooks)	A.R.7 Use mathematics to show and understand social phenomena (e.g., determine profit from student and adult ticket sales)
5.R.9 Use mathematics to show and understand mathematical phenomena (i.e., find the missing value that makes the equation true: $(3 + 4) + 5 = 3 + (4 + \_\_\_)$	6.R.9 Use mathematics to show and understand mathematical phenomena (e.g., Find the missing value: $(3 + 4) + 5 = 3 + (4 + \_\_\_)$	7.R.11Use mathematics to show and understand mathematical phenomena (e.g., use tables, graphs, and equations to show a pattern underlying a function)	8.R.11 Use mathematics to show and understand mathematical phenomena (e.g., use tables, graphs, and equations to show a pattern underlying a function)	A.R.8 Use mathematics to show and understand mathematical phenomena (e.g., compare the graphs of the functions represented by the equations $y = x^2$ and $y = -x^2$)