Mathematics Concepts & Connections Articulation Guide

MATHEMATICS CONCEPTS & CONNECTIONS ARTICULATION GUIDE

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PART I: INTRODUCTION

The Mathematics Concepts and Connections Articulation Guide provides support in identifying concepts aligned to the 2023 *Mathematics Standards of Learning* (SOL) that articulate across mathematics grade levels or courses. This guide connects prerequisite learning within the context of new learning in such a way that allows teachers to build and support connections between the relevant prerequisite (subsumed) skills and grade level/content area work in support of students' access to content. This guide can highlight targeted areas for individual student remediation when used in conjunction with *Mathematics Standards of Learning* Student Detail by Question (SDBQ) reports; data from other reports using SOL item indicators; or, high-quality instructional materials, aids, and assessments.

The Mathematics Concepts and Connections Articulation Guide is divided into five strands: Number and Number Sense (NS); Computation and Estimation (CE); Measurement and Geometry (MG); Probability and Statistics (PS); and, Patterns, Functions, and Algebra (PFA). A description of the overarching strand summary is provided for each strand. Where *appropriate* and *applicable*, content from EOC courses – Algebra 1, Geometry, and Algebra 2 – are connected within the strands. Intentional and purposeful connections are made related to End Of Course mathematics content.

Below shows the hierarchical structure of this guide:

- **Strand Summary** (NS, CE, MG, PS, PFA)
    - **Strand Concepts** – Macro concepts of K – Algebra 2 content with the grade level or content area *Understanding the Standards* document link applied.
        - **Associated Standards** – Standard numbers that are aligned to each Strand Concept.
            - **Strand Comprehensive Summary Table –** Summary table of the Strand Concepts and standards within a specific strand. *Note:* Some standards are listed at the standard level while others are listed at the bullet level. When no bullet is listed, it is assumed that all content within the standard addresses the Strand Concept (e.g., Number and Number Sense Strand Concept 3).

The content provided in this guide is embedded within the **Concepts and Connections** component of each Mathematics Instructional Guide, a companion document to the 2023 Mathematics *Standards of Learning*. This component outlines concepts transcending grade levels and woven throughout the K through 12 program as appropriate at each level. The **Concepts** are interrelated and support the **Connections** to illustrate commonalities and connections.

PART II: NUMBER AND NUMBER SENSE

Number and Number Sense (NS) Strand Summary

There are multiple representations of numbers and relationships among numbers that provide meaning and structure and allow for sense-making.

Strand Concept 1: Exponents, Squares, and Square Roots		
Grade Level/ Content Area	**Standard**	**Description**
Grade 6	6.NS.3	The student will recognize and represent patterns with whole number exponents and perfect squares.
Grade 7	7.NS.3	The student will recognize and describe the relationship between square roots and perfect squares.
Grade 8	8.NS.1a	Estimate and identify the two consecutive natural numbers between which the positive square root of a given number lies and justify which natural number is the better approximation. Numbers are limited to natural numbers from 1 to 400.
	8.NS.1b	Use rational approximations (to the nearest hundredth) of irrational numbers to compare, order, and locate values on a number line. Radicals may include both positive and negative square roots of values from 0 to 400 yielding an irrational number.
Algebra 1	A.EO.3	The student will derive and apply the laws of exponents.
	A.EO.4	The student will simplify and determine equivalent radical expressions involving square roots of whole numbers and cube roots of integers.

Strand Concept 2: Flexible Counting Strategies		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.NS.1	The student will utilize flexible counting strategies to determine and describe quantities up to 100.
Grade 1	1.NS.1	The student will utilize flexible counting strategies to determine and describe quantities up to 120.
Grade 2	2.NS.1	The student will utilize flexible counting strategies to determine and describe quantities up to 200.
Grade 3	3.NS.1a	Read and write six-digit whole numbers in standard form, expanded form, and word form.
	3.NS.1c	Compose, decompose, and represent numbers up to 9,999 in multiple ways, according to place value (e.g., 256 can be 1 hundred, 14 tens, 16 ones, but also 25 tens, 6 ones), with and without models.
Grade 4	4.NS.1a	Read nine-digit whole numbers, presented in standard form, and represent the same number in written form.
	4.NS.1b	Write nine-digit whole numbers in standard form when the numbers are presented orally or in written form.

Strand Concept 3: Money *Money is explored contextually through numeracy and number sense.*		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.NS.1j	Group a collection of up to 100 objects (e.g., counters, *pennies*, cubes) into sets of ten and count by tens to determine the total.
Grade 1	1.NS.1f	Identify a penny, nickel, and dime by their attributes and describe the number of pennies equivalent to a nickel and a dime.
	1.NS.1g	Count by ones, fives, or tens to determine the value of a collection of like coins (pennies, nickels, or dimes), whose total value is 100 cents or less.
Grade 2	2.NS.4	The student will solve problems that involve counting and representing money amounts up to $2.00.
Grade 3	3.NS.4	The student will solve problems, including those in context, that involve counting, comparing, representing, and making change for money amounts up to $5.00.

Strand Concept 4: Number Sets and Characteristics of Numbers		
Grade Level/ Content Area	**Standard**	**Description**
Grade 2	2.NS.1h	Represent even numbers (up to 50) with concrete objects, using two equal groups or two equal addends
	2.NS.1i	Represent odd numbers (up to 50) with concrete objects, using two equal groups with one leftover or two equal addends plus 1.
	2.NS.1j	Determine whether a number (up to 50) is even or odd using concrete objects and justify reasoning (e.g., dividing collections of objects into two equal groups, pairing objects).
Grade 5	5.NS.2	The student will demonstrate an understanding of prime and composite numbers and determine the prime factorization of a whole number up to 100.
Grade 8	8.NS.2	The student will investigate and describe the relationship between the subsets of the real number system.
Algebra 2	A2.EO.4	The student will perform operations on complex numbers.

Strand Concept 5: Place Value		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.NS.1e	Use objects, drawings, words, or numbers to compose and decompose numbers 11-19 into a ten and some ones.
	K.NS.1j	Group a collection of up to 100 objects (e.g., counters, pennies, cubes) into sets of ten and count by tens to determine the total.
Grade 1	1.NS.1e	Group a collection of up to 120 objects into tens and ones, and count to determine the total (e.g., 5 groups of ten and 6 ones is equal to 56 total objects).
	1.NS.2c	Create a concrete or pictorial representation of a number using tens and ones and write the corresponding numeral up to 120.
Grade 2	2.NS.2	The student will demonstrate an understanding of the ten-to-one relationships of the base 10 number system to represent, compare, and order whole numbers up to 999.

Grade 3	3.NS.1	The student will use place value understanding to read, write, and determine the place and value of each digit in a whole number, up to six digits, with and without models.
Grade 4	4.NS.1	The student will use place value understanding to read, write, and identify the place and value of each digit in a nine-digit whole number.

Strand Concept 6: Rational Numbers *(identify, represent, model, order, and compare quantities)*		
Grade Level/ Content Area	**Standard**	**Description**
Grade 1	1.NS.3	The student will use mathematical reasoning and justification to solve contextual problems that involve partitioning models into two and four equal-sized parts.
Grade 2	2.NS.3	The student will use mathematical reasoning and justification to solve contextual problems that involve partitioning models into equal-sized parts (halves, fourths, eighths, thirds, and sixths).
Grade 3	3.NS.3	The student will use mathematical reasoning and justification to represent and compare fractions (proper and improper) and mixed numbers with denominators of 2, 3, 4, 5, 6, 8, and 10), including those in context.
Grade 4	4.NS.3	The student will use mathematical reasoning and justification to represent, compare, and order fractions (proper, improper, and mixed numbers with denominators 12 or less), with and without models.
	4.NS.4	The student will use mathematical reasoning and justification to represent, compare, and order decimals through thousandths with and without models.
Grade 5	5.NS.1a	Use concrete and pictorial models to represent fractions with denominators that are thirds, eighths, and factors of 100 in their equivalent decimal form.
	5.NS.1b	Use concrete and pictorial models to represent decimals in their equivalent fraction form (with denominators that are thirds, eighths, and factors of 100).
	5.NS.1d	Compare (using symbols <, >, =) and order (least to greatest and greatest to least) a set of no more than four decimals, fractions, and/or mixed numbers using multiple strategies.
Grade 6	6.NS.1	The student will reason and use multiple strategies to express equivalency, compare, and order numbers written as fractions, mixed numbers, decimals, and percents.
	6.NS.2	The student will reason and use multiple strategies to represent, compare, and order integers.
Grade 7	7.NS.1	The student will investigate and describe the concept of exponents for powers of ten and compare and order numbers greater than zero written in scientific notation.
	7.NS.2	The student will reason and use multiple strategies to compare and order rational numbers.
Grade 8	8.NS.1c	Use multiple strategies (e.g., benchmarks, number line, equivalency) to compare and order no more than five real numbers expressed as integers, fractions (proper or improper), decimals, mixed numbers, percents, numbers written in scientific notation, radicals, and π. Radicals may include both positive and negative square roots of values from 0 to 400. Ordering may be in ascending or descending order. Justify solutions orally, in writing or with a model.
Geometry	G.RLT.1	The student will translate logic statements, identify conditional statements, and use and interpret Venn diagrams.

Strand Concept 7: Rational Numbers *(equivalencies)*		
Grade Level/ Content Area	**Standard**	**Description**
Grade 4	4.NS.5	The student will reason about the relationship between fractions and decimals (limited to halves, fourths, fifths, tenths, and hundredths) to identify and represent equivalencies.
Grade 5	5.NS.1a	Use concrete and pictorial models to represent fractions with denominators that are thirds, eighths, and factors of 100 in their equivalent decimal form.
	5.NS.1b	Use concrete and pictorial models to represent decimals in their equivalent fraction form (with denominators that are thirds, eighths, and factors of 100).
	5.NS.1c	Identify equivalent relationships between decimals and fractions with denominators that are thirds, eighths, and factors of 100 in their equivalent decimal form, with and without models.
Grade 6	6.NS.1	The student will reason and use multiple strategies to express equivalency, compare, and order numbers written as fractions, mixed numbers, decimals, and percents.
Grade 7	7.NS.1c	Convert between numbers greater than 0 written in scientific notation and decimals.

Strand Concept 8: Whole Numbers *(identify, represent, order, and compare quantities)*		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.NS.2	The student will identify, represent, and compare quantities up to 30.
Grade 1	1.NS.2	The student will represent, compare, and order quantities up to 120.
Grade 2	2.NS.2	The student will demonstrate an understanding of the ten-to-one relationships of the base 10 number system to represent, compare, and order whole numbers up to 999.
Grade 3	3.NS.1	The student will use place value understanding to read, write, and determine the place and value of each digit in a whole number, up to six digits, with and without models.
	3.NS.2	The student will demonstrate an understanding of the base 10 system to compare and order whole numbers up to 9,999.
Grade 4	4.NS.1	The student will use place value understanding to read, write, and identify the place and value of each digit in a nine-digit whole number.
	4.NS.2	The student will demonstrate an understanding of the base 10 system to compare and order whole numbers up to seven digits.

Number and Number Sense (NS) Comprehensive Strand Summary								
Grade Level/ Content Area	**Strand Concept 1: Exponents, Squares, and Square Roots**	**Strand Concept 2: Flexible Counting Strategies**	**Strand Concept 3: Money** ***Money is explored contextually through numeracy and number***	**Strand Concept 4: Number Sets and Characteristics of Numbers**	**Strand Concept 5: Place Value**	**Strand Concept 6: Rational Numbers** ***(identify, represent, model, order, and compare quantities)***	**Strand Concept 7: Rational Numbers** ***Equivalencies***	**Strand Concept 8: Whole Numbers** ***Identify, represent, order, and compare quantities***
Kindergarten		K.NS.1	K.NS.1j		K.NS.1c, j			K.NS.2
Grade 1		1.NS.1	1.NS.1f-g		1.NS.1e 1.NS.2c	1.NS.3		1.NS.2
Grade 2		2.NS.1	2.NS.4	2.NS.1h-j	2.NS.2	2.NS.3		2.NS.2
Grade 3		3.NS.1a 3.NS.1c	3.NS.4		3.NS.1	3.NS.3		3.NS.1 3.NS.2
Grade 4		4.NS.1a-b			4.NS.1	4.NS.3 4.NS.4	4.NS.5	4.NS.1 4.NS.2
Grade 5				5.NS.2		5.NS.1a-b, d	5.NS.1a-c	
Grade 6	6.NS.3					6.NS.1 6.NS.2	6.NS.1	
Grade 7	7.NS.3					7.NS.1 7.NS.2	7.NS.1c	
Grade 8	8.NS.1a-b			8.NS.2		8.NS.1c		
Algebra 1	A.EO.3 A.EO.4							
Geometry						G.RLT.1		
Algebra 2				A2.EO.4				

PART III: COMPUTATION AND ESTIMATION

Computation and Estimation (CE) Strand Summary

Estimation and the operations allow us to model, represent, and solve different types of problems with rational numbers.

Strand Concept 1: Proportional Relationships		
Grade Level/ Content Area	**Standard**	**Description**
Grade 7	7.CE.2	The student will solve problems, including those in context, involving proportional relationships.
Grade 8	8.CE.1	The student will estimate and apply proportional reasoning and computational procedures to solve contextual problems.
Geometry	G.TR.3e	Solve problems, including those in context involving attributes of similar triangles.
Algebra 2	A2.F1.d	Determine when two variables are directly proportional, inversely proportional, or neither, given a table of values. Write an equation and create a graph to represent a *direct or inverse variation*, including situations in context.

Strand Concept 2: Whole Numbers – Fluency and Operations		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.CE.1b	Recognize and describe with fluency part-part-whole relationships for numbers up to 5 in a variety of configurations.
Grade 1	1.CE.1	The student will recall with automaticity addition and subtraction facts within 10 and represent, solve, and justify solutions to single-step problems, including those in context, using addition and subtraction with whole numbers within 20.
Grade 2	2.CE.1d	Demonstrate fluency with addition and subtraction within 20 by applying reasoning strategies (e.g., doubles, near doubles, make-a-ten, compensations, inverse relationships).
	2.CE.1e	Recall with automaticity addition and subtraction facts within 20.
	2.CE.1f	Use patterns, models, and strategies to make generalizations about the algebraic properties for fluency (e.g., 4 + 3 is equal to 3 + 4; 0 + 8 = 8).
	2.CE.1h	Use inverse relationships to write all related facts connected to a given addition or subtraction fact model within 20 (e.g., given a model for 3 + 4 = 7, write 4 + 3 = 7, 7 – 4 = 3, and 7 – 3 = 4).
Grade 3	3.CE.2	The student will recall with automaticity multiplication and division facts, through 10 × 10; and represent, solve, and justify solutions to single-step contextual problems using multiplication and division with whole numbers.
Grade 4	4.CE.2b	Recall with automaticity the multiplication facts through 12 × 12 and the corresponding division facts.
	4.CE.2c	Create an equation using addition, subtraction, multiplication, and division to represent the relationship between equivalent mathematical expressions (e.g., 4 × 3 = 2 × 6; 10 + 8 = 36 ÷ 2; 12 × 4 = 60 − 12).

	4.CE.2d	Identify and use the appropriate symbol to distinguish between expressions that are equal and expressions that are not equal, using addition, subtraction, multiplication, and division (e.g., $4 \times 12 = 8 \times 6$ and $64 \div 8 \neq 8 \times 8$).
	4.CE.2e	Determine all factor pairs for a whole number 1 to 100, using concrete, pictorial, and numerical representations.
	4.CE.2f	Determine common factors and the greatest common factor of no more than three numbers.
	4.CE.2g	Apply strategies (e.g., rounding, place value, properties of multiplication and/or addition) and algorithms, including the standard algorithm, to estimate and determine the product of two whole numbers when given two-digit factor and a one-digit factor; a three-digit factor and a one-digit factor; a two-digit factor and a two-digit factor.
Grade 5	5.CE.4	The student will simplify numerical expressions with whole numbers using the order of operations.

Strand Concept 3: Whole Numbers – Contextual Problems		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.CE.1	The student will model and solve single-step contextual problems using addition and subtraction with whole numbers within 10.
Grade 1	1.CE.1	The student will recall with automaticity addition and subtraction facts within 10 and represent, solve, and justify solutions to single-step problems, including those in context, using addition and subtraction with whole numbers within 20.
Grade 2	2.CE.1a	Apply strategies, (e.g., rounding to the nearest 10, compatible numbers, other number relationships), to estimate a solution for single-step addition or subtraction problems, including those in context, where addends and minuends do not exceed 100.
	2.CE.1b	Apply strategies, (e.g., the use of concrete and pictorial models, place value, properties of addition, the relationship between addition and subtraction) to determine the sum or difference of two whole numbers where addends or minuends do not exceed 100.
	2.CE.1c	Represent, solve, and justify solutions to single-step and multistep contextual problems (e.g., join, separate, part-part whole, comparison) involving addition or subtraction of whole numbers where addends or minuends do not exceed 100.
	2.CE.1g	Determine the missing number in an equation (number sentence) through modeling and justification with addition and subtraction within 20 (e.g., 3 + = 5 or + 2 = 5; 5 – = 3 or 5 – 2 =).
	2.CE.1i	Describe the not equal symbol ($\neq$) as representing a relationship where expressions on either side of the not equal symbol represent different values and justify reasoning.
	2.CE.1j	Represent and justify the relationship between values and expressions as equal or not equal using appropriate models and/or symbols (e.g., 9 + 24 = 10 + 23; 45 - 9 = 46 - 10; 15 +16 $\neq$ 31 +15).
Grade 3	3.CE.1	The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition and subtraction with whole numbers where addends and minuends do not exceed 1,000.

	3.CE.2	The student will recall with automaticity multiplication and division facts, through 10 × 10; and represent, solve, and justify solutions to single-step contextual problems using multiplication and division with whole numbers.
Grade 4	4.CE.1	The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition and subtraction with whole numbers.
	4.CE.2a	Determine and justify whether an estimate or an exact answer is appropriate when solving contextual problems involving multiplication, and division of whole numbers. Refine estimates by adjusting the final amount, using terms such as closer to, between, and a little more than.
	4.CE.2h	Estimate, represent, solve, and justify solutions to single-step and multistep contextual problems that involve multiplication with whole numbers.
	4.CE.2i	Apply strategies (e.g., rounding, compatible numbers, place value) and algorithms, including the standard algorithm, to estimate and determine the quotient of two whole numbers, given a one-digit divisor and a two- or three-digit dividend, with and without remainders.
	4.CE.2j	Estimate, represent, solve, and justify solutions to single-step contextual problems involving division with whole numbers.
	4.CE.2k	Interpret the quotient and remainder when solving a contextual problem.
Grade 5	5.CE.1	The student will estimate, represent, solve, and justify solutions to single-step and multistep contextual problems using addition, subtraction, multiplication, and division with whole numbers.

Strand Concept 4: Rational Numbers – Contextual Problems		
Grade Level/ Content Area	**Standard**	**Description**
Grade 4	4.CE.3	The student will estimate, represent, solve, and justify solutions to single-step problems, including those in context, using addition and subtraction of fractions (proper, improper, and mixed numbers with like denominators of 2, 3, 4, 5, 6, 8, 10, and 12), with and without models; and solve single-step contextual problems involving multiplication of a whole number (12 or less) and a unit fraction, with models.
	4.CE.4	The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition and subtraction of decimals through the thousandths, with and without models.
Grade 5	5.CE.2	The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition and subtraction of fractions with like and unlike denominators (with and without models), and solve single step contextual problems involving multiplication of a whole number and a proper fraction, with models.
	5.CE.3	The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition, subtraction, multiplication, and division with decimal numbers.
Grade 6	6.CE.1d	The student will estimate, demonstrate, solve, and justify solutions to problems using operations with fractions and mixed numbers, including those in context.
	6.CE.2	The student will estimate, demonstrate, solve, and justify solutions to problems using operations with integers, including those in context.

Grade 7	7.CE.1	The student will estimate, solve, and justify solutions to multistep contextual problems involving operations with rational numbers.
Grade 8	8.CE.1	The student will estimate and apply proportional reasoning and computational procedures to solve contextual problems.
Algebra 1	A.EI.1f	Verify possible solution(s) to multistep linear equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context.
	A.EI.2h	Verify possible solution(s) to a system of two linear equations, a linear inequality in two variables, or a system of two linear inequalities algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context.
	A.EI.3c	Verify possible solution(s) to a quadratic equation in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
Geometry	G.RLT.1	The student will translate logic statements, identify conditional statements, and use and interpret Venn diagrams.
	G.RLT.3	The student will solve problems, including contextual problems, involving symmetry and transformation.
Algebra 2	A2.EI.1e	Verify possible solution(s) to absolute value equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context
	A2.EI.2d	Verify possible solution(s) to quadratic equations or inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
	A2.EI.3d	Verify possible solution(s) to linear-quadratic or quadratic-quadratic system of equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
	A2.EI.4c	Verify possible solution(s) to rational equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
	A2.EI.5b	Verify possible solution(s) to radical equations algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
	A2.EI.6d	Verify possible solution(s) to polynomial equations of degree three or higher algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and interpret solutions in context.

Computation and Estimation (CE) Comprehensive Strand Summary				
Grade Level/ Content Area	**Strand Concept 1: Proportional Relationships**	**Strand Concept 2: Whole Numbers – Fluency and Operations**	**Strand Concept 3: Whole Numbers – Contextual Problems**	**Strand Concept 4: Rational Numbers – Contextual Problems**
Kindergarten		K.CE.1b	K.CE.1	
Grade 1		1.CE.1	1.CE.1	
Grade 2		2.CE.1d-h	2.CE.1a-c, g, i, j	
Grade 3		3.CE.2	3.CE.1 3.CE.2	
Grade 4		4.CE.2b-g	4.CE.1 4.CE.2a, h-k	4.CE.3 4.CE.4
Grade 5		5.CE.4	5.CE.1	5.CE.2 5.CE.3
Grade 6				6.CE.1d 6.CE.2
Grade 7	7.CE.2			7.CE.1
Grade 8	8.CE.1			8.CE.1
Algebra 1				A.EI.1f A.EI.2h A.EI.3c
Geometry	G.TR.3e			
Algebra 2	A2.F.1d			A2.EI.1e A2.EI.2d A2.EI.3d A2.EI.4c A2.EI.5b A2.EI.6d

PART IV: MEASUREMENT AND GEOMETRY

Measurement and Geometry (MG) Strand Summary

Analyzing and describing geometric objects, the relationships and structures among them, or the space that they occupy can be used to classify, quantify, measure, or count one or more attributes.

Strand Concept 1: Time		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.MG.1a [v]	The student will reason mathematically by making direct comparisons between two objects or events using the attributes of length, height, weight, volume, and time.
	K.MG.3	The student will describe the units of time represented in a calendar.
Grade 1	1.MG.3	The student will demonstrate an understanding of the concept of passage of time (to the nearest hour and half-hour) and the calendar.
Grade 2	2.MG.2	The student will demonstrate an understanding of the concept of time to the nearest five minutes, using analog and digital clocks.
Grade 3	3.MG.3	The student will demonstrate an understanding of the concept of time to the nearest minute and solve single-step contextual problems involving elapsed time in one-hour increments within a 12-hour period.
Grade 4	4.MG.2	The student will solve single-step and multistep contextual problems involving elapsed time (limited to hours and minutes within a 12-hour period).

Strand Concept 2: Pythagorean Theorem		
Grade Level/ Content Area	**Standard**	**Description**
Grade 8	8.MG.4	The student will apply the Pythagorean Theorem to solve problems involving right triangles, including those in context.
Geometry	G.TR.3c	The student will, given information in the form of a figure or statement, prove and justify two triangles are similar using direct and indirect proofs, and solve problems, including those in context, involving measured attributes of similar triangles.
	G.TR.4	The student will model and solve problems, including those in context, involving trigonometry in right triangles and applications of the Pythagorean Theorem.

Strand Concept 3: Congruent and Similar Figures		
Grade Level/ Content Area	**Standard**	**Description**
Grade 2	2.MG.3	The student will identify, describe, and create plane figures (including circles, triangles, squares, and rectangles) that have at least one line of symmetry and explain its relationship with congruency.
Grade 6	6.MG.4	The student will determine congruence of segments, angles, and polygons.
Grade 7	7.MG.2	The student will solve problems and justify relationships of similarity using proportional reasoning.
Geometry	G.TR.2	The student will, given information in the form of a figure or statement, prove two triangles are congruent using direct and indirect proofs, and solve problems involving measured attributes of congruent triangles.
	G.TR.3	The student will, given information in the form of a figure or statement, prove and justify two triangles are similar using direct and indirect proofs, and solve problems, including those in context, involving measured attributes of similar triangles.

Strand Concept 4: Coordinate Plane and Transformations		
Grade Level/ Content Area	**Standard**	**Description**
Grade 6	6.MG.3	The student will describe the characteristics of the coordinate plane and graph ordered pairs.
Grade 7	7.MG.4	The student will apply dilations of polygons in the coordinate plane.
Grade 8	8.MG.3	The student will apply translations and reflections to polygons in the coordinate plane.
Algebra 1	A.EI.1	The student will represent, solve, explain, and interpret the solution to multistep linear equations and inequalities in one variable and literal equations for a specified variable.
	A.EI.2	The student will represent, solve, explain, and interpret the solution to a system of two linear equations, a linear inequality in two variables, or a system of two linear inequalities in two variables.
	A.EI.3	The student will represent, solve, and interpret the solution to a quadratic equation in one variable.
	A.F.1	The student will investigate, analyze, and compare linear functions algebraically and graphically, and model linear relationships.
Geometry	G.RLT.3	The student will solve problems, including contextual problems, involving symmetry and transformation.
	G.PC.4	The student will solve problems in the coordinate plane involving equations of circles.
Algebra 2	A2.F.1	The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations.

Strand Concept 5: Circles and Polygons *(identify, describe, classify, measure)*		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.MG.2	The student will identify, describe, name, compare, and construct plane figures (circles, triangles, squares, and rectangles).
Grade 1	1.MG.2	The student will describe, sort, draw, and name plane figures (circles, triangles, squares, and rectangles), and compose larger plane figures by combining simple plane figures.
Grade 2	2.MG.2	The student will identify, describe, and create plane figures (including circles, triangles, squares, and rectangles) that have at least one line of symmetry and explain its relationship with congruency.
Grade 3	3.MG.4	The student will identify, describe, classify, compare, combine, and subdivide polygons.
Grade 4	4.MG.5	The student will classify and describe quadrilaterals (parallelograms, rectangles, squares, rhombi, and/or trapezoids) using specific properties and attributes.
	4.MG.6	The student will identify, describe, compare, and contrast plane and solid figures according to their characteristics (number of angles, vertices, edges, and the number and shape of faces), with and without models.
Grade 5	5.MG.3	The student will classify and measure angles and triangles, and solve problems, including those in context.
Grade 6	6.MG.1	The student will identify the characteristics of circles and solve problems, including those in context, involving circumference and area.
	6.MG.2	The student will reason mathematically to solve problems, including those in context, that involve the area and perimeter of triangles and parallelograms.
Grade 7	7.MG.3	The student will compare and contrast quadrilaterals based on their properties and determine unknown side lengths and angle measures of quadrilaterals.
Geometry	G.PC.1	The student will prove and justify theorems and properties of quadrilaterals, and verify and use properties of quadrilaterals to solve problems, including the relationships between the sides, angles, and diagonals.
	G.PC.2	The student will verify relationships and solve problems involving the number of sides and angles of convex polygons.
	G.PC.3	The student will solve problems, including those in context, by applying properties of circles.

Strand Concept 6: Length, Weight/Mass, Liquid Volume, and Temperature		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.MG.1a [i-iv]	The student will reason mathematically by making direct comparisons between two objects or events using the attributes of length, height, weight, volume, and time.
Grade 1	1.MG.1	The student will reason mathematically using nonstandard units to measure and compare objects by length, weight, and volume.
Grade 2	2.MG.1	The student will reason mathematically using standard units (U.S. Customary) with appropriate tools to estimate, measure, and compare objects by length, weight, and liquid volume to the nearest whole unit.
Grade 3	3.MG.1	The student will reason mathematically using standard units (U.S. Customary and metric) with appropriate tools to estimate and measure objects by length, weight/mass, and liquid volume to the nearest half or whole unit.
Grade 4	4.MG.1	The student will reason mathematically to solve problems, including those in context, that involve length, weight/mass, and liquid volume using U.S. Customary and metric units.
Grade 5	5.MG.1	The student will reason mathematically to solve problems, including those in context, that involve length, mass, and liquid volume using metric units.

Strand Concept 7: Point, Line, Line Segment, Ray, Angle *(identify, describe, classify, and measure)*		
Grade Level/ Content Area	**Standard**	**Description**
Grade 4	4.MG.4	The student will identify, describe, and draw points, rays, line segments, angles, and lines, including intersecting, parallel, and perpendicular lines.
Grade 5	5.MG.3	The student will classify and measure angles and triangles, and solve problems, including those in context.
Grade 8	8.MG.1	The student will use the relationships among pairs of angles that are vertical angles, adjacent angles, supplementary angles, and complementary angles to determine the measure of unknown angles.
Geometry	G.RLT.2	The student will analyze the relationships of parallel lines cut by a transversal.
	G.TR.1	The student will determine the relationships between the measures of angles and lengths of sides in triangles, including problems in context.

Strand Concept 8: Plane Figures (2D) and Solid Figures (3D) *(compare, contrast, construct)*		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.MG.2	The student will identify, describe, name, compare, and construct plane figures (circles, triangles, squares, and rectangles).
Grade 1	1.MG.2	The student will describe, sort, draw, and name plane figures (circles, triangles, squares, and rectangles), and compose larger plane figures by combining simple plane figures.
Grade 2	2.MG.3	The student will identify, describe, and create plane figures (including circles, triangles, squares, and rectangles) that have at least one line of symmetry and explain its relationship with congruency.
Grade 3	3.MG.4	The student will identify, describe, classify, compare, combine, and subdivide polygons.
Grade 4	4.MG.5	The student will classify and describe quadrilaterals (parallelograms, rectangles, squares, rhombi, and/or trapezoids) using specific properties and attributes.
	4.MG.6	The student will identify, describe, compare, and contrast plane and solid figures according to their characteristics (number of angles, vertices, edges, and the number and shape of faces), with and without models.
Grade 7	7.MG.3	The student will compare and contrast quadrilaterals based on their properties and determine unknown side lengths and angle measures of quadrilaterals.
Geometry	G.DF.1	The student will analyze the relationships of parallel lines cut by a transversal.
	G.DF.2	The student will determine the relationships between the measures of angles and lengths of sides in triangles, including problems in context.

Strand Concept 9: Area, Perimeter, and Circumference		
Grade Level/ Content Area	**Standard**	**Description**
Grade 3	3.MG.2	The student will use multiple representations to estimate and solve problems, including those in context, involving area and perimeter (in both U.S. Customary and metric units).
Grade 4	4.MG.3	The student will use multiple representations to develop and use formulas to solve problems, including those in context, involving area and perimeter limited to rectangles and squares (in both U.S. Customary and metric units).
Grade 5	5.MG.2	The student will use multiple representations to solve problems, including those in context, involving perimeter, area, and volume.
Grade 6	6.MG.1	The student will identify the characteristics of circles and solve problems, including those in context, involving circumference and area.
	6.MG.2	The student will reason mathematically to solve problems, including those in context, that involve the area and perimeter of triangles and parallelograms.
Grade 8	8.MG.5	The student will solve area and perimeter problems involving composite plane figures, including those in context.
Geometry	G.PC.2	The student will verify relationships and solve problems involving the number of sides and angles of convex polygons.
	G.PC.3	The student will solve problems, including those in context, by applying properties of circles.

Strand Concept 10: Surface Area and Volume		
Grade Level/ Content Area	**Standard**	**Description**
Grade 5	5.MG.2	The student will use multiple representations to solve problems, including those in context, involving perimeter, area, and volume.
Grade 6	6.MG.1	The student will identify the characteristics of circles and solve problems, including those in context, involving circumference and area.
	6.MG.2	The student will reason mathematically to solve problems, including those in context, that involve the area and perimeter of triangles and parallelograms.
Grade 7	7.MG.1	The student will investigate and determine the volume formula for right cylinders and the surface area formulas for rectangular prisms and right cylinders and apply the formulas in context.
Grade 8	8.MG.2	The student will investigate and determine the surface area of square-based pyramids and the volume of cones and square-based pyramids.
Geometry	G.DF.1	The student will create models and solve problems, including those in context, involving surface area and volume of rectangular and triangular prisms, cylinders, cones, pyramids, and spheres.

Measurement and Geometry (MG) Comprehensive Strand Summary										
Grade Level/ Content Area	**Strand Concept 1: Time**	**Strand Concept 2: Pythagorean Theorem**	**Strand Concept 3: Congruent and Similar Figures**	**Strand Concept 4: Coordinate Plane and Transformations**	**Strand Concept 5: Circles and Polygons**	**Strand Concept 6: Length, Weight/Mass, Liquid Volume, and Temperature**	**Strand Concept 7: Point, Line, Line Segment, Ray, Angle *(identify, describe, classify, and measure)***	**Strand Concept 8: Plane Figures (2D) and Solid Figures (3D) *(compare, contrast, construct)***	**Strand Concept 9: Area, Perimeter, and Circumference**	**Strand Concept 10: Surface Area and Volume**
Kindergarten	K.MG.1a [v] K.MG.3				K.MG.2	K.MG.1a [i-iv]		K.MG.2		
Grade 1	1.MG.3				1.MG.2	1.MG.1		1.MG.2		
Grade 2	2.MG.2		2.MG.3		2.MG.2	2.MG.1		2.MG.3		
Grade 3	3.MG.3				3.MG.4	3.MG.1		3.MG.4	3.MG.2	
Grade 4	4.MG.2				4.MG.5 4.MG.6	4.MG.1	4.MG.4	4.MG.5	4.MG.3	
Grade 5					5.MG.3	5.MG.1	5.MG.3		5.MG.2	5.MG.2
Grade 6			6.MG.4	6.MG.3	6.MG.1 6.MG.2				6.MG.1 6.MG.2	6.MG.1 6.MG.2
Grade 7			7.MG.2	7.MG.4	7.MG.3			7.MG.3		7.MG.1
Grade 8		8.MG.4		8.MG.3			8.MG.1		8.MG.5	8.MG.2
Algebra 1				A.EI.1 A.EI.2 A.EI.3 A.F.1						
Geometry		G.TR.3c G.TR.4	G.TR.2 G.TR.3	G.RLT.3 G.PC.4	G.PC.1 G.PC.2 G.PC.3		G.RLT.2 G.TR.1	G.DF.1 G.DF.2	G.PC.2 G.PC.3	G.DF.1
Algebra 2				A2.F.1						

PART V: PROBABILITY AND STATISTICS

Probability and Statistics (PS) Strand Summary

The world can be investigated through posing questions and collecting, representing, analyzing, and interpreting data to describe and predict events and real-world phenomena. K-12 students will engage with the data cycle. The data cycle includes formulating questions to be explored with data; collecting or acquiring data; organizing and representing data; and analyzing data and communicating results.

Strand Concept 1: Data Cycle		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.PS.1	The student will apply the data cycle (pose questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***object graphs and picture graphs***.
Grade 1	1.PS.1	The student will apply the data cycle (pose questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***object graphs, picture graphs, and tables***.
Grade 2	2.PS.1	The student will apply the data cycle (pose questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***pictographs and bar graphs***.
Grade 3	3.PS.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***pictographs and bar graphs***.
Grade 4	4.PS.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***line graphs***.
Grade 5	5.PS.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***line plots (dot plots) and stem-and-leaf plots***.
Grade 6	6.PS.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***circle graphs***.
Grade 7	7.PS.2	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***histograms***.
Grade 8	8.PS.2	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***boxplots***.
	8.PS.3	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***scatterplots***.
Algebra 1	A.ST.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results)

		with a focus on representing bivariate data in scatterplots and determining the curve of best fit using ***linear and quadratic functions***.
Geometry	G.RLT.1	The student will translate, construct, and judge the validity of a logical argument and use and interpret Venn diagrams.
Algebra 2	A2.ST.1	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***univariate quantitative data represented by a smooth curve, including a normal curve***.
	A2.ST.2	The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on ***representing bivariate data in scatterplots and determining the curve of best fit using linear, quadratic, exponential, or a combination of these functions***.

Strand Concept 2: Measures of Center		
Grade Level/ Content Area	**Standard**	**Description**
Grade 5	5.PS.2	The student will solve contextual problems using measures of center and the range.
Grade 6	6.PS.2	The student will represent the mean as a balance point and determine the effect on statistical measures when a data point is added, removed, or changed.
Algebra 2	A2.ST.1h	Determine the solution to problems involving the relationship of the mean, standard deviation, and z-score of a data set represented by a smooth or normal curve.

Strand Concept 3: Outcome of Events		
Grade Level/ Content Area	**Standard**	**Description**
Grade 4	4.PS.2	The student will model and determine the probability of an outcome of a simple event.
Grade 5	5.PS.3	The student will determine the probability of an outcome by constructing a model of a sample space and using the Fundamental (Basic) Counting Principle.
Grade 7	7.PS.1	The student will use statistical investigation to determine the probability of an event and investigate and describe the difference between the experimental and theoretical probability.
Grade 8	8.PS.1	The student will use statistical investigation to determine the probability of independent and dependent events, including those in context.
Algebra 2	A2.ST.1h	Determine the solution to problems involving the relationship of the mean, standard deviation, and z-score of a data set represented by a smooth or normal curve.

Probability and Statistics (PS) Comprehensive Strand Summary			
Grade Level/ Content Area	**Strand Concept 1: Data Cycle**	**Strand Concept 2: Measures of Center**	**Strand Concept 3: Outcomes of Events**
Kindergarten	K.PS.1		
Grade 1	1.PS.1		
Grade 2	2.PS.1		
Grade 3	3.PS.1		
Grade 4	4.PS.1		4.PS.2
Grade 5	5.PS.1	5.PS.2	5.PS.3
Grade 6	6.PS.1	6.PS.2	
Grade 7	7.PS.2		7.PS.1
Grade 8	8.PS.2 8.PS.3		8.PS.1
Algebra 1	A.ST.1		
Geometry	G.RLT.1		
Algebra 2	A2.ST.1 A2.ST.2	A2.ST.1h	A2.ST.1h

PART VI: PATTERNS, FUNCTIONS, AND ALGEBRA

Patterns, Functions, and Algebra (PFA) Strand Summary

Relationships can be described, and generalizations can be made using patterns, relations, and functions. Algebraic equations and inequalities can be used to represent and solve real world problems.

Strand Concept 1: Algebraic Expressions		
Grade Level/ Content Area	**Standard**	**Description**
Grade 5	5.PFA.2	The student will investigate and use variables in contextual problems.
Grade 6	6.PFA.3a	Identify and develop examples of the following algebraic vocabulary: equation, variable, expression, term, and coefficient.
Grade 7	7.PFA.2	The student will simplify numerical expressions, simplify and generate equivalent algebraic expressions in one variable, and evaluate algebraic expressions for given replacement values of the variables.
Grade 8	8.PFA.1	The student will represent, simplify, and generate equivalent algebraic expressions in one variable.
Algebra 1	A.EO.1	The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables.
	A.EO.2	The student will perform operations on and factor polynomial expressions in one variable.
	A.EO.4	The student will simplify and determine equivalent radical expressions involving square roots of whole numbers and cube roots of integers.
Algebra 2	A2.EO.1	The student will derive and apply the laws of exponents.
	A2.EO.2	The student will simplify and determine equivalent radical expressions involving square roots of whole numbers and cube roots of integers.
	A2.EO.3	The student will perform operations on polynomial expressions and factor polynomial expressions in one and two variables.
	A2.EO.4	The student will perform operations on complex numbers.

Strand Concept 2: Functions		
Grade Level/ Content Area	**Standard**	**Description**
Grade 8	8.PFA.2	The student will determine whether a given relation is a function and determine the domain and range of a function.
Algebra 1	A.F.1	The student will investigate, analyze, and compare linear functions algebraically and graphically, and model linear relationships.
	A.F.2	The student will investigate, analyze, and compare characteristics of functions, including quadratic and exponential functions, and model quadratic and exponential relationships.
Algebra 2	A2.F.1	The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations.

	A2.F.2	The student will investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically.

Strand Concept 3: Equality and Solving Equations		
Grade Level/ Content Area	**Standard**	**Description**
Grade 5	5.PFA.2	The student will investigate and use variables in contextual problems.
Grade 6	6.PFA.3	The student will write and solve one-step linear equations in one variable, including contextual problems that require the solution of a one-step linear equation in one variable.
Grade 7	7.PFA.3	The student will write and solve two-step linear equations in one variable, including problems in context, that require the solution of a two-step linear equation in one variable.
Grade 8	8.PFA.4	The student will write and solve multistep linear equations in one variable, including problems in context that require the solution of a multistep linear equation in one variable.
Algebra 1	A.EI.1	The student will represent, solve, explain, and interpret the solution to multistep ***linear equations*** and inequalities in one variable and ***literal equations*** for a specified variable.
	A.EI.2	The student will represent, solve, explain, and interpret the solution to a ***system of two linear equations***, a linear inequality in two variables, or a system of two linear inequalities in two variables.
	A.EI.3	The student will represent, solve, and interpret the solution to a ***quadratic equation*** in one variable.
Geometry	All	Applications of equality and solving equations are subsumed skills embedded throughout the Geometry *Standards of Learning*.
Algebra 2	A2.EI.1	The student will represent, solve, and interpret the solution to absolute value ***equations*** and inequalities in one variable.
	A2.EI.2	The student will represent, solve, and interpret the solution to ***quadratic equations*** in one variable over the set of complex numbers and solve quadratic inequalities in one variable.
	A2.EI.3	The student will solve a ***system of equations*** in two variables containing a quadratic expression.
	A2.EI.4	The student will represent, solve, and interpret the solution to an ***equation containing rational algebraic expressions***.
	A2.EI.5	The student will represent, solve, and interpret the solution to an ***equation containing a radical expression***.
	A2.EI.6	The student will represent, solve, and interpret the solution to a ***polynomial equation***.

Strand Concept 4: Inequality and Solving Inequalities		
Grade Level/ Content Area	**Standard**	**Description**
Grade 6	6.PFA.4	The student will represent a contextual situation using a linear inequality in one variable with symbols and graphs on a number line.
Grade 7	7.PFA.4	The student will write and solve one- and two-step linear inequalities in one variable, including problems in context, that require the solution of a one- and two-step linear inequality in one variable.
Grade 8	8.PFA.5	The student will create and solve multistep linear inequalities in one variable, including problems in context that require the solution of a multistep linear inequality in one variable.
Algebra 1	A.EI.1	The student will represent, solve, explain, and interpret the solution to multistep ***linear*** equations and ***inequalities*** in one variable and literal equations for a specified variable.
	A.EI.2	The student will represent, solve, explain, and interpret the solution to a system of two linear equations, a ***linear inequality*** in two variables, or a ***system of two linear inequalities*** in two variables.
Geometry	G.TR.4	The student will model and solve problems, including those in context, involving trigonometry in right triangles and applications of the Pythagorean Theorem (***reference the Pythagorean Inequality Theorem***).
Algebra 2	A2.EI.1	The student will represent, solve, and interpret the solution to absolute value equations and ***inequalities*** in one variable.
	A2.EI.2	The student will represent, solve, and interpret the solution to ***quadratic equations*** in one variable over the set of complex numbers and ***solve quadratic inequalities*** in one variable.

Strand Concept 5: Proportional Relationships and Slope		
Grade Level/ Content Area	**Standard**	**Description**
Grade 6	6.PFA.1	The student will use ratios to represent relationships between quantities, including those in context.
	6.PFA.2	The student will identify and represent proportional relationships between two quantities, including those in context (unit rates are limited to positive values).
Grade 7	7.PFA.1	The student will investigate and analyze proportional relationships between two quantities using verbal descriptions, tables, equations in y = mx form, and graphs, including problems in context.
Grade 8	8.PFA.3	The student will represent and solve problems, including those in context, by using linear functions and analyzing their key characteristics (the value of the y-intercept (b) and the coordinates of the ordered pairs in graphs will be limited to integers).
Algebra 1	A.F.1	The student will investigate, analyze, and compare linear functions algebraically and graphically, and model linear relationships.
	A.ST.1g	Investigate and explain the meaning of the rate of change (slope) and y-intercept (constant term) of a linear model in context.
Geometry	G.TR.3	The student will, given information in the form of a figure or statement, prove and justify two triangles are similar using direct and indirect proofs, and solve problems, including those in context, involving measured attributes of similar triangles.

Strand Concept 6: Patterns		
Grade Level/ Content Area	**Standard**	**Description**
Kindergarten	K.PFA.1	The student will identify, describe, extend, and create simple repeating patterns using various representations.
Grade 1	1.PFA.1	The student will identify, describe, extend, create, and transfer repeating patterns and increasing patterns using various representations.
Grade 2	2.PFA.2	The student will describe, extend, create, and transfer repeating and increasing patterns (limited to addition of whole numbers) using various representations.
Grade 3	3.PFA.1	The student will identify, describe, extend, and create increasing and decreasing patterns (limited to addition and subtraction of whole numbers), including those in context, using various representations.
Grade 4	4.PFA.1	The student will identify, describe, extend, and create increasing and decreasing patterns (limited to addition, subtraction, and multiplication of whole numbers), including those in context, using various representations.
Grade 5	5.PFA.1	The student will identify, describe, extend, and create increasing and decreasing patterns with whole numbers, fractions, and decimals, including those in context, using various representations.

Patterns, Functions, and Algebra (PFA) Comprehensive Strand Summary						
Grade Level/ Content Area	**Strand Concept 1: Algebraic Expressions**	**Strand Concept 2: Functions**	**Strand Concept 3: Equality and Solving Equations**	**Strand Concept 4: Inequality and Solving Inequalities**	**Strand Concept 5: Proportional Relationships and Slope**	**Strand Concept 6: Patterns**
Kindergarten						K.PFA.1
Grade 1						1.PFA.1
Grade 2						2.PFA.2
Grade 3						3.PFA.1
Grade 4						4.PFA.1
Grade 5	5.PFA.2		5.PFA.2			5.PFA.1
Grade 6	6.PFA.3a		6.PFA.3	6.PFA.4	6.PFA.1 6.PFA.2	
Grade 7	7.PFA.2		7.PFA.3	7.PFA.4	7.PFA.1	
Grade 8	8.PFA.1	8.PFA.2	8.PFA.4	8.PFA.5	8.PFA.3	
Algebra 1	A.EO.1 A.EO.2 A.EO.4	A.F.1 A.F.2	A.EI.1 A.EI.2 A.EI.3	A.EI.1 A.EI.2	A.F.1 A.ST.1g	
Geometry			All	G.TR.4	G.TR.3	
Algebra 2	A2.EO.1 A2.EO.2 A2.EO.3 A2.EO.4	A2.F.1 A2.F.2	A2.EI.1 A2.EI.2 A2.EI.3 A2.EI.4 A2.EI.5 A2.EI.6	A2.EI.1 A2.EI.2		