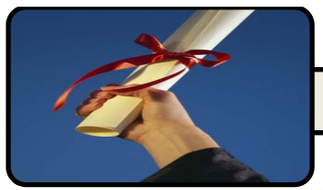
Access Points to Next Generation Sunshine State Standards (Florida Standards) – Mathematics 2014

Access Points for Mathematics: Access to the Florida Standards for Students with a Significant Cognitive Disability



College Ready

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Access for All

Bureau of Exceptional Education and Student Services
Spring 2014

History of the Access Points

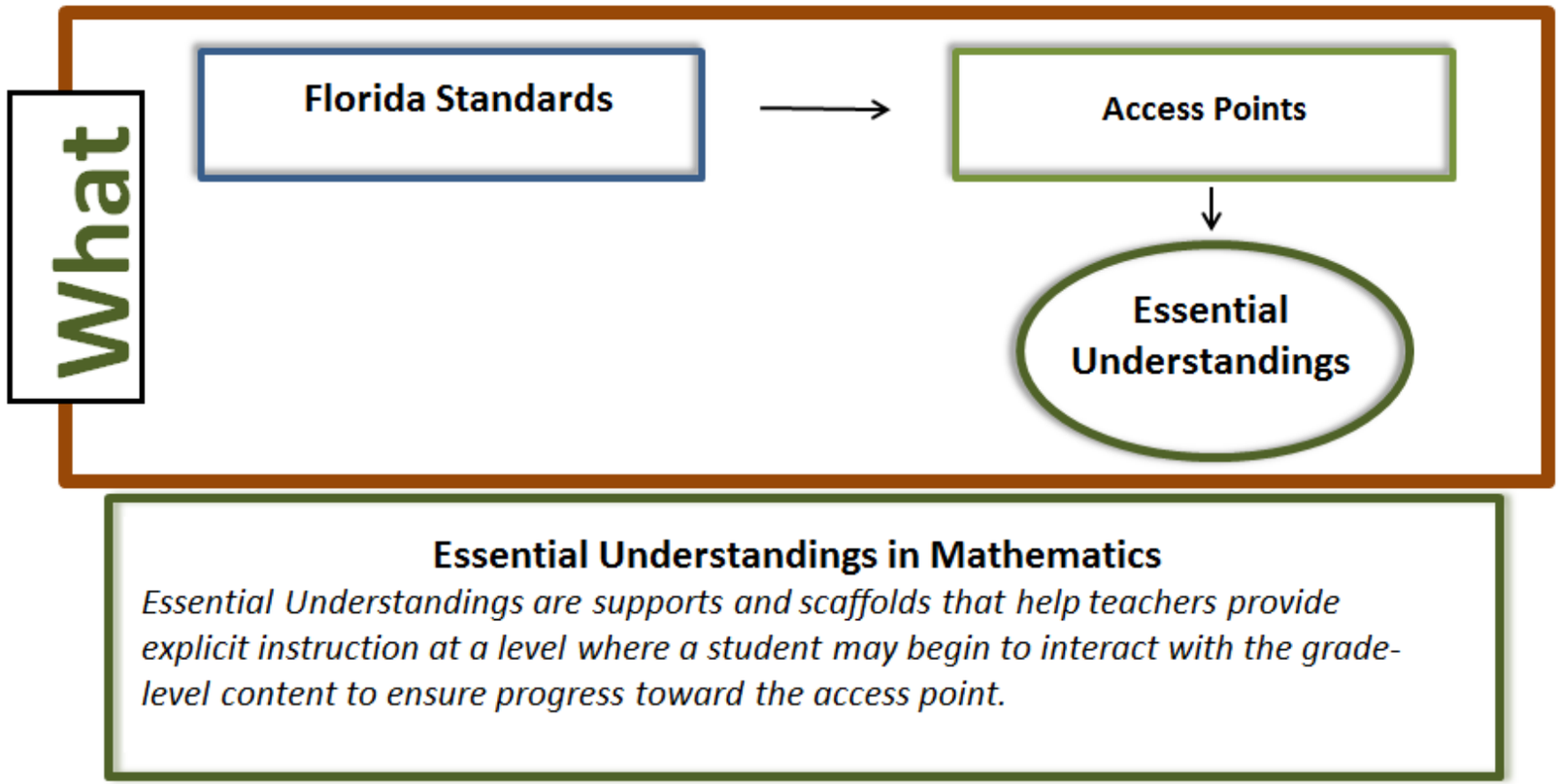
Beginning in 2006, access points became the means through which students with a significant cognitive disability have accessed the general education content found in the Next Generation Sunshine State Standards (NGSSS). Access points were developed for all standards with three complexity levels that represented a continuum of understanding (participatory, supported and independent). Courses containing these standards, also known as *access courses*, were developed to support access for all students to the general education standards. These courses are setting neutral, which means a student working on access points can attend classes with non-disabled peers in general education courses. Students with a significant cognitive disability work on a “parallel curriculum” that is aligned to the general education content but delivered at the individual level of complexity needed for the student to be successful.

When the State Board of Education adopted the new Florida Standards in March 2014, it became necessary to develop new access points that are appropriate for Florida’s students. As is the case with the NGSSS, these new access points for students with a significant cognitive disability fully align with the Florida Standards. Moving forward, access courses for students with significant cognitive disabilities will be revised to contain these new access points. This way, all students can continue to access the general education standards in a way that promotes high expectations and encourage inclusive learning environments for students with a significant cognitive disability.

New Access Points Aligned to the Florida Standard

Making the content of the Florida Standards personally relevant and accessible to students with a significant cognitive disability begins by articulating the general education content through access points. The new access points in mathematics identify the most salient grade-level, core academic content for students with a significant cognitive disability. It is important to note that the access points are NOT “extensions” to the standards, but rather they illustrate the necessary core content, knowledge and skills students with a significant cognitive disability need at each grade to promote success in the next grade. Essential Understandings, or EUs, are supports and scaffolds that unpack the access points to assist in the teaching and learning of the standards.

Structure of the Access Points and Related Supports

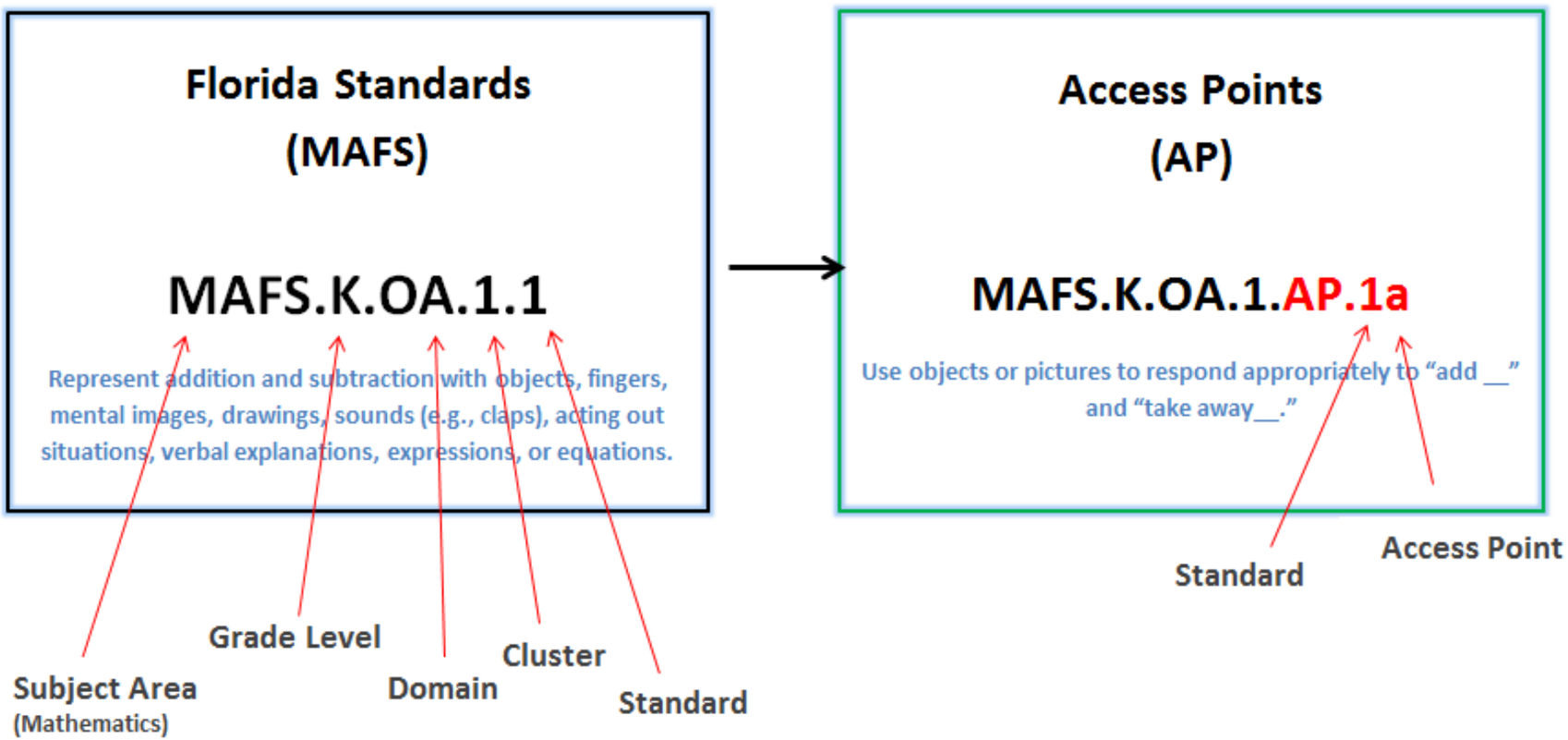


Supports: Essential Understandings in Mathematics

Supporting the effective teaching and learning of the access points will be done by providing teachers with professional development including instruction in the use of classroom formative and summative assessments, instructional resources, and lesson planning tools. One such support is the Essential Understandings, or EUs. For every access point (AP), teachers will be provided EUs. The EUs further breakdown the standard to support a student's learning along the continuum as they progress toward mastery of the access points.

Florida Standards	Access Point (AP)	Essential Understandings (EUs)
MAFS.8.G.1.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	**MAFS.8.G.1.AP.4a** Recognize congruent and similar figures.	Recognize corresponding points and sides in figures (e.g., match concrete examples of congruent shapes, match concrete examples of similar shapes). Understand concepts and vocabulary: figures, congruent, similar. Describe circles, squares, rectangles and triangles by telling about their shape, sides, lines and angles.

Florida's Unique
Access Point (AP)
Coding System



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Florida Standards: Mathematics with Access Points

GRADE: K

Domain: COUNTING AND CARDINALITY		
Cluster 1: Know number names and the count sequence.		
STANDARD CODE	**STANDARD**	
MAFS.K.CC.1.1	Count to 100 by ones and by tens. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.K.CC.1.AP.1a	Rote count up to 10.
	MAFS.K.CC.1.AP.1b	Rote count up to 31.
	MAFS.K.CC.1.AP.1c	Rote count up to 100.
MAFS.K.CC.1.2	Count forward beginning from a given number within the known sequence (instead of having to begin at 1). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.K.CC.1.AP.2a	Rote count forward from a given number (instead of having to begin at 1).
MAFS.K.CC.1.3	Read and write numerals from 0 to 20. Represent a number of objects with a written numeral from 0–20 (with 0 representing a count of no objects). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.K.CC.1.AP.3a	Identify numerals 1-10.
	MAFS.K.CC.1.AP.3b	Identify the numerals 1–10 when presented with the name of the number.
	MAFS.K.CC.1.AP.3c	Write or select the numerals 1–10.

Cluster 2: Count to tell the number of objects.	
STANDARD CODE	**STANDARD**

MAFS.K.CC.2.4	Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same, regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.K.CC.2.AP.4a — Identify the set that has more.
	MAFS.K.CC.2.AP.4b — Count up to 10 objects in a line, rectangle, or array.
	MAFS.K.CC.2.AP.4c — Match the numeral to the number of objects in a set.
MAFS.K.CC.2.5	Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.K.CC.2.AP.5a — Identify the number of objects in a line, rectangle, or array.
	MAFS.K.CC.2.AP.5b — Count up to 10 objects in a line, rectangle or array.

Cluster 3: Compare numbers.

STANDARD CODE	STANDARD
MAFS.K.CC.3.6	Identify whether the number of objects in one group is greater than, less than or equal to the number of objects in another group, e.g., using matching and counting strategies.
	ACCESS POINTS
	MAFS.K.CC.3.AP.6a — Compare two sets and identify the set that is greater than the other set, up to 10.
	MAFS.K.CC.3.AP.6b — Compare two sets and identify the set that is less than the other set, up to 10.
	MAFS.K.CC.3.AP.6c — Compare 2 sets and identify if the set is equal to the other set, up to 10.
MAFS.K.CC.3.7	Compare two numbers between 1 and 10 presented as written numerals. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.K.CC.3.AP.7a — Identify the smaller or larger number given two numbers between 0 and 10.

Domain: OPERATIONS AND ALGEBRAIC THINKING

Cluster 1: Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

STANDARD CODE	STANDARD
MAFS.K.OA.1.1	Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions or equations. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.K.OA.1.AP.1a	Model with objects or communicate which groups of objects model "add___" or "take away" within 5 objects.
MAFS.K.OA.1.2	Solve addition and subtraction word problems, and add and subtract within 10 e.g., by using objects or drawings to represent the problem. (Students are not required to independently read the word problems.) *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.OA.1.AP.2a	Solve one-step addition and subtraction word problems, and add and subtract within 10 using objects, drawings or pictures.
	MAFS.K.OA.1.AP.2b	Count two sets to find sums up to 10.
	MAFS.K.OA.1.AP.2c	Solve word problems within 10.
MAFS.K.OA.1.4	For any number from 1 to 9, find the number that makes 10 when added to the given number (e.g., by using objects or drawings) and record the answer with a drawing or equation. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.OA.1.AP.4a	For any number from 1-4, find the number that makes 5 when added to the given number by using objects or drawings.
	MAFS.K.OA.1.AP.4b	For any number from 1-9, find the number that makes 10 when added to the given number by using objects or drawings.
MAFS.K.OA.1.5	Fluently add and subtract within 5. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.K.OA.1.AP.5a	Add to find sums within 5.
	MAFS.K.OA.1.AP.5b	Subtract to find difference within 5.
MAFS.K.OA.1.a	Use addition and subtraction within 10 to solve word problems involving both addends unknown, e.g., by using objects, drawings and equations with symbols for the unknown numbers to represent the problem. (Students are not required to independently read the word problems.)	
	ACCESS POINTS	
	MAFS.K.OA.1.AP.aa	Use objects to solve word problems related to addition and subtraction that involve unknowns and quantities up to 5.

Domain: NUMBER AND OPERATIONS IN BASE TEN

Cluster 1: Work with numbers 11-19 to gain foundations for place value.

STANDARD CODE	STANDARD	
MAFS.K.NBT.1.1	Compose and decompose numbers from 11 to 19 into ten ones and some further ones (e.g., by using objects or drawings) and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six seven, eight or nine ones.	
	ACCESS POINTS	
	MAFS.K.NBT.1.AP.1a	Identify the value of a base ten block and ones block to build representations of 11-15.

Domain: MEASUREMENT AND DATA

Cluster 1: Describe and compare measurable attributes.

STANDARD CODE	STANDARD	
MAFS.K.MD.1.1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.MD.1.AP.1a	Describe objects in terms of measurable attributes (longer, shorter, heavier, lighter, etc.).
MAFS.K.MD.1.2	Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.MD.1.AP.2a	Compare two objects with a measurable attribute in common to see which object has more/less of the attribute (length, height, weight).
MAFS.K.MD.1.a	Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.	
	ACCESS POINTS	
	MAFS.K.MD.1.AP.aa	Express the length of an object as a whole number of lengths of another shorter object.

Cluster 2: Classify objects and count the number of objects in each category.

STANDARD CODE	STANDARD	
MAFS.K.MD.2.3	Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.MD.2.AP.3a	Sort objects by characteristics (e.g., big/little, colors, shapes).

Domain: GEOMETRY

Cluster 1: Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders and spheres).

STANDARD CODE	STANDARD	
MAFS.K.G.1.1	Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind and next to. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.G.1.AP.1a	Use spatial language (e.g., above, below) to describe two-dimensional shapes.
MAFS.K.G.1.2	Correctly name shapes, regardless of their orientations or overall size. *Cognitive Complexity:* Level 1: Recall	

	ACCESS POINTS	
	MAFS.K.G.1.AP.2a	Recognize two-dimensional shapes (e.g., circle, square, triangle, rectangle), regardless of orientation or size.
MAFS.K.G.1.3	Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.K.G.1.AP.3a	Identify shapes as two-dimensional (lying flat) or three-dimensional (“solid”).

Cluster 2: Analyze, compare, create, and compose shapes.

STANDARD CODE	STANDARD	
MAFS.K.G.2.4	Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length). *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.K.G.2.AP.4a	Recognize two-dimensional shapes in environment, regardless or orientation or size.
	MAFS.K.G.2.AP.4b	Use spatial language (e.g., above, below, etc.) to describe three-dimensional shapes.
MAFS.K.G.2.5	Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.G.2.AP.5a	Build three-dimensional shapes.
MAFS.K.G.2.6	Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.K.G.2.AP.6a	Compose a larger shape from smaller shapes.

GRADE: 1

Domain: OPERATIONS AND ALGEBRAIC THINKING

Cluster 1: Represent and solve problems involving addition and subtraction.

STANDARD CODE	STANDARD
MAFS.1.OA.1.1	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (Students are not required to independently read the word problems.) *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.1.OA.1.AP.1a	Use base ten blocks to model simple addition or subtraction equations within 20 based upon a word problem.
	MAFS.1.OA.1.AP.1b	Solve addition and subtraction word problems within 20.
	MAFS.1.OA.1.AP.1c	Solve one-step addition and subtraction word problems where the change or result is unknown (4 + _ = 7) or (4 + 3 = __), within 20 using objects, drawings or pictures.
MAFS.1.OA.1.2	Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings and equations with a symbol for the unknown number to represent the problem. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.1.AP.2a	Solve word problems that include combining three quantities whose sum is less than 10 using objects or drawings.

Cluster 2: Understand and apply properties of operations and the relationship between addition and subtraction.

STANDARD CODE	STANDARD	
MAFS.1.OA.2.3	Apply properties of operations as strategies to add and subtract. *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a 10, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.2.AP.3a	Recognize addition as commutative.
MAFS.1.OA.2.4	Understand subtraction as an unknown-addend problem. *For example, solve 10 – 8 by finding the number that makes 10 when added to 8.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.2.AP.4a	Recognize subtraction as the inverse of addition.

Cluster 3: Add and subtract within 20.

STANDARD CODE	STANDARD	
MAFS.1.OA.3.5	Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.1.OA.3.AP.5a	Use counting on to find the sum of two addends.
	MAFS.1.OA.3.AP.5b	Count backwards to subtract to a specified number family less than 20.
MAFS.1.OA.3.6	Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making 10 (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a 10 (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.3.AP.6a	Add and subtract within 10, demonstrating fluency for addition and subtraction within 5.

Cluster 4: Work with addition and subtraction equations.

STANDARD CODE	STANDARD	
MAFS.1.OA.4.7	Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.4.AP.7a	Determine if equations are true or false, using whole number totals within 10.
MAFS.1.OA.4.8	Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = [ ] – 3, 6 + 6 = [ ].* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.OA.4.AP.8a	Find the unknown number in an addition or subtraction equation using whole number totals within 10.

Domain: NUMBER AND OPERATIONS IN BASE TEN

Cluster 1: Extend the counting sequence.

STANDARD CODE	STANDARD	
MAFS.1.NBT.1.1	Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.1.NBT.1.AP.1a	Rote count up to 100.

Cluster 2: Understand place value.

STANDARD CODE	STANDARD	
MAFS.1.NBT.2.2	Understand that the two digits of a two-digit number represent amounts of tens and ones. a. 10 can be thought of as a bundle of ten ones — called a “ten.” b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight or nine tens (and 0 ones). d. Decompose two-digit numbers in multiple ways (e.g., 64 can be decomposed into 6 tens and 4 ones or into 5 tens and 14 ones). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.NBT.2.AP.2a	Build representations of numbers up to 31 by creating a group of 10 and some ones (e.g., 13 = one ten and three ones).

	MAFS.1.NBT.2.AP.2b	Identify the value of the numbers in the tens and one place within a given number up to 31.
MAFS.1.NBT.2.3	Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, = and <. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.NBT.2.AP.3a	Compare two-digit numbers up to 31 using representations and numbers (e.g., identify more tens, fewer tens, more ones, fewer ones, larger number, smaller number).

Cluster 3: Use place value understanding and properties of operations to add and subtract.

STANDARD CODE	STANDARD	
MAFS.1.NBT.3.4	Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.NBT.3.AP.4a	Use base ten blocks to add single digit numbers that result in two-digit sums.
	MAFS.1.NBT.3.AP.4b	Add a two-digit number and a multiple of 10 (e.g., 28 + 30 =).
MAFS.1.NBT.3.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.NBT.3.AP.5a	Using base ten blocks, find 10 more or 10 less of a given two-digit number (e.g., what is 10 more than 20? What is 10 less than 30?).
MAFS.1.NBT.3.6	Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.NBT.3.AP.6a	Using base ten blocks, subtract multiples of 10 (e.g., 30 – 10 =).

Domain: MEASUREMENT AND DATA

Cluster 1: Measure lengths indirectly and by iterating length units.

STANDARD CODE	STANDARD	
MAFS.1.MD.1.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.1.MD.1.AP.1a	Order up to three objects based on a measurable attribute (height, weight, length).
	MAFS.1.MD.1.AP.1b	Order three objects by length; compare the lengths of two objects indirectly by using a third object.
MAFS.1.MD.1.a	Understand how to use a ruler to measure length to the nearest inch. a. Recognize that the ruler is a tool that can be used to measure the attribute of length. b. Understand the importance of the zero point and end point and that the length measure is the span between two points.	

	c. Recognize that the units marked on a ruler have equal length intervals and fit together with no gaps or overlaps. These equal interval distances can be counted to determine the overall length of an object. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.1.MD.1.AP.aa — Use a ruler to measure the length of an object with exact whole units.

Cluster 2: Tell and write time.

STANDARD CODE	STANDARD
MAFS.1.MD.2.3	Tell and write time in hours and half-hours using analog and digital clocks. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.1.MD.2.AP.3a — Tell time in whole and half hours using a digital clock.
MAFS.1.MD.2.a	Identify and combine values of money in cents up to one dollar working with a single unit of currency. • Identify the value of coins (pennies, nickels, dimes, quarters). • Compute the value of combinations of coins (pennies and/or dimes). • Relate the value of pennies, dimes and quarters to the dollar (e.g., There are 100 pennies or ten dimes or four quarters in one dollar.) (Students are not expected to understand the decimal notation for combinations of dollars and cents.)
	ACCESS POINTS
	MAFS.1.MD.2.AP.aa — Identify the value of pennies, nickels, dimes and quarters.

Cluster 3: Represent and interpret data.

STANDARD CODE	STANDARD
MAFS.1.MD.3.4	Organize, represent and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category and how many more or less are in one category than in another. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.1.MD.3.AP.4a — Analyze data by sorting into two categories; answer questions about the total number of data points and how many in each category.
	MAFS.1.MD.3.AP.4b — Using a picture graph, represent each object/person counted on the graph (1:1 correspondence) for two or more categories.
	MAFS.1.MD.3.AP.4c — Compare the values of the two categories of data in terms of more or less.

Domain: GEOMETRY

Cluster 1: Reason with shapes and their attributes.

STANDARD CODE	STANDARD
MAFS.1.G.1.1	Distinguish between defining attributes (e.g., triangles are closed and three sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.1.G.1.AP.1a — Distinguish two-dimensional shapes based upon their defining attributes (i.e., edges, vertices, and points).
MAFS.1.G.1.2	Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.1.G.1.AP.2a — Draw or build two- and three-dimensional shapes.
MAFS.1.G.1.3	Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of, the shares. Understand for these examples that decomposing into more equal shares creates smaller shares. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.1.G.1.AP.3a — Partition circles and rectangles into two and four equal parts.

GRADE: 2

Domain: OPERATIONS AND ALGEBRAIC THINKING

Cluster 1: Represent and solve problems involving addition and subtraction.

STANDARD CODE	STANDARD
MAFS.2.OA.1.1	Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart and comparing, with unknowns in all positions (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.OA.1.AP.1a — Solve addition and subtraction word problems within 100 using objects, drawings, or pictures.
	MAFS.2.OA.1.AP.1b — Use pictures, drawings or objects to represent the steps of a problem.
	MAFS.2.OA.1.AP.1c — Write or select an equation representing the problems and its solution.
MAFS.2.OA.1.a	Determine the unknown whole number in an equation relating four or more whole numbers. For example, determine the unknown number that makes the equation true in the equations 37 + 10 + 10 = _____ + 18, ? – 6 = 13 – 4, and 15 – 9 = 6 + .
	ACCESS POINTS
	MAFS.2.OA.1.AP.aa — Find the unknown number in an equation (+, -).

Cluster 2: Add and subtract within 20.

STANDARD CODE	STANDARD
MAFS.2.OA.2.2	Fluently add and subtract within 20 using mental strategies. By end of grade 2, know from memory all sums of two one-digit numbers. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.2.OA.2.AP.2a — Fluently add and subtract within 10.

Cluster 3: Work with equal groups of objects to gain foundations for multiplication.

STANDARD CODE	STANDARD
MAFS.2.OA.3.3	Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by twos; write an equation to express an even number as a sum of two equal addends. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.OA.3.AP.3a — Identify a group of fewer than 10 objects as odd or even.
MAFS.2.OA.3.4	Use addition to find the total number of objects arranged in rectangular arrays with up to five rows and up to five columns; write an equation to express the total as a sum of equal addends. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.2.OA.3.AP.4a — Find the total number inside an array with the number of objects in each column or rows not larger than four.
	MAFS.2.OA.3.AP.4b — Represent an array with numbers up to four rows and four columns.

Domain: NUMBER AND OPERATIONS IN BASE TEN

Cluster 1: Understand place value.

STANDARD CODE	STANDARD
MAFS.2.NBT.1.1	Understand that the three digits of a three-digit number represent amounts of hundreds, tens and ones (e.g., 706 equals 7 hundreds, 0 tens and 6 ones). Understand the following as special cases: a. 100 can be thought of as a bundle of ten tens — called a “hundred.” b. The numbers 100, 200, 300, 400, 500, 600, 700, 800 or 900 refer to one, two, three, four, five, six, seven, eight or nine hundreds (and 0 tens and 0 ones). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.NBT.1.AP.1a — With base ten blocks, build representations of three-digit numbers using hundreds, tens and ones.

MAFS.2.NBT.1.2	Count within 1,000; skip-count by fives, tens and hundreds. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.NBT.1.AP.2a	Skip count by fives up to 100.
	MAFS.2.NBT.1.AP.2b	Skip count by tens up to 200.
	MAFS.2.NBT.1.AP.2c	Skip count by hundreds up to 1000.
MAFS.2.NBT.1.3	Read and write numbers to 1,000 using base-ten numerals, number names and expanded form. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.NBT.1.AP.3a	Identify numerals 0–100.
	MAFS.2.NBT.1.AP.3b	Identify the numeral between 0 and 100 when presented with the name.
	MAFS.2.NBT.1.AP.3c	Write or select the numerals 0–100.
	MAFS.2.NBT.1.AP.3d	Write or select the expanded form for any two-digit number.
	MAFS.2.NBT.1.AP.3e	Explain what the zero represented in place value (hundreds, tens, ones) in a number.
MAFS.2.NBT.1.4	Compare two three-digit numbers based on meanings of the hundreds, tens and ones digits, using >, = and < symbols to record the results of comparisons. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.NBT.1.AP.4a	Compare (greater than, less than, equal to) two numbers up to 100.
	MAFS.2.NBT.1.AP.4b	Compare two-digit numbers using representations and numbers (e.g., identify more tens, fewer tens, more ones, fewer ones, larger numbers, smaller numbers).
	MAFS.2.NBT.1.AP.4c	Compare three-digit numbers using representations and numbers (e.g., identify more hundreds, less hundreds, more tens, less tens, more ones, less ones, larger number, smaller number).

Cluster 2: Use place value understanding and properties of operations to add and subtract.

STANDARD CODE	STANDARD	
MAFS.2.NBT.2.5	Fluently add and subtract within 100 using strategies based on place value, properties of operations and/or the relationship between addition and subtraction. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.NBT.2.AP.5a	Fluently add or subtract within 50.
	MAFS.2.NBT.2.AP.5b	Model addition and subtraction with base ten blocks within 100.
MAFS.2.NBT.2.6	Add up to four two-digit numbers using strategies based on place value and properties of operations. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.NBT.2.AP.6a	Combine three two-digit numbers within 20.
MAFS.2.NBT.2.7	Add and subtract within 1,000, using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.NBT.2.AP.7a	Decompose tens into ones and/or hundreds into tens in subtraction situations.
	MAFS.2.NBT.2.AP.7b	Compose ones into tens and/or tens into hundreds in addition situations.
MAFS.2.NBT.2.8	Mentally add 10 or 100 to a given number 100–900 and mentally subtract 10 or 100 from a given number 100–900. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.NBT.2.AP.8a	Mentally add or subtract 10 from a given set from the tens family (e.g., What is 10 more than 50? What is 10 fewer than70?).
	MAFS.2.NBT.2.AP.8b	Mentally add or subtract 100 from a given set from the hundreds family (e.g., What is 100 more than 500? What is 100 fewer than 700?).
MAFS.2.NBT.2.9	Explain why addition and subtraction strategies work, using place value and the properties of operations. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.2.NBT.2.AP.9a	Communicate processes of addition and subtraction.

Domain: MEASUREMENT AND DATA

Cluster 1: Measure and estimate lengths in standard units.

STANDARD CODE	STANDARD	
MAFS.2.MD.1.1	Measure the length of an object to the nearest inch, foot, centimeter or meter by selecting and using appropriate tools, such as rulers, yardsticks, meter sticks and measuring tapes. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.MD.1.AP.1a	Select appropriate tool and unit of measurement to measure an object (ruler or yard stick, inches or feet).
	MAFS.2.MD.1.AP.1b	Demonstrate or identify appropriate measuring techniques.
MAFS.2.MD.1.2	Describe the inverse relationship between the size of a unit and number of units needed to measure a given object. Example: Suppose the perimeter of a room is lined with one-foot rulers. Now suppose we want to line it with yardsticks instead of rulers. Will we need more or fewer yardsticks than rulers to do the job? Explain your answer. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.MD.1.AP.2a	Recognize that standard units can be decomposed into smaller units.
	MAFS.2.MD.1.AP.2b	Measure the attributes (length, width, height) of an object using two different size units.
MAFS.2.MD.1.3	Estimate lengths using units of inches, feet, yards, centimeters and meters. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.MD.1.AP.3a	Estimate the length of an object using units of feet and inches.
MAFS.2.MD.1.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	

	MAFS.2.MD.1.AP.4a	Solve problems involving the difference in standard length units.

Cluster 2: Relate addition and subtraction to length.

STANDARD CODE	STANDARD
MAFS.2.MD.2.5	Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.MD.2.AP.5a — Solve addition and subtraction word problems involving the difference in standard length units.
MAFS.2.MD.2.6	Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.MD.2.AP.6a — Use number lines to solve addition or subtraction problems up to 100.

Cluster 3: Work with time and money.

STANDARD CODE	STANDARD
MAFS.2.MD.3.7	Tell and write time from analog and digital clocks to the nearest five minutes. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.2.MD.3.AP.7a — Tell and write time in hours and half-hours using analog and digital clocks.
	MAFS.2.MD.3.AP.7b — Categorize everyday activities into a.m. and p.m.
MAFS.2.MD.3.8	Solve one- and two-step word problems involving dollar bills (singles, fives, tens, twenties and hundreds) or coins (quarters, dimes, nickels and pennies) using $ and ¢ symbols appropriately. Word problems may involve addition, subtraction and equal groups situations. Example: The cash register shows that the total for your purchase is 59¢. You gave the cashier three quarters. How much change should you receive from the cashier? a. Identify the value of coins and paper currency. b. Compute the value of any combination of coins within one dollar. c. Compute the value of any combinations of dollars (e.g., If you have three ten-dollar bills, one five-dollar bill and two one-dollar bills, how much money do you have?). d. Relate the value of pennies, nickels, dimes and quarters to other coins and to the dollar (e.g., There are five nickels in one quarter. There are two nickels in one dime. There are two and a half dimes in one quarter. There are twenty nickels in one dollar.). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.2.MD.3.AP.8a — Solve word problems using dollar bills, quarters, dimes, nickels or pennies up to $50.

Cluster 4: Represent and interpret data.

STANDARD CODE	STANDARD	
MAFS.2.MD.4.9	Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.MD.4.AP.9a	Organize linear measurement data by representing continuous data on a line plot.
MAFS.2.MD.4.10	Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart and compare problems using information presented in a bar graph. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.2.MD.4.AP.10a	Identify the value of each category represented on a picture graph and bar graph.
	MAFS.2.MD.4.AP.10b	Organize data by representing on a pictorial graph or bar graph.
	MAFS.2.MD.4.AP.10c	Compare the information shown in a bar graph or picture graph with up to four categories. Solve simple comparisons of how many more or how many less.

Domain: GEOMETRY

Cluster 1: Reason with shapes and their attributes.

STANDARD CODE	STANDARD	
MAFS.2.G.1.1	Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons and cubes. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.G.1.AP.1a	Identify two-dimensional shapes, such as rhombuses, pentagons, hexagons, octagons, and ovals, as well as equilateral, isosceles, and scalene triangles.
	MAFS.2.G.1.AP.1b	Distinguish two- or three-dimensional shapes based upon their attributes (i.e., number of sides, equal or different lengths of sides, number of faces and number of corners).
	MAFS.2.G.1.AP.1c	Draw two-dimensional shapes with specific attributes.
MAFS.2.G.1.2	Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.G.1.AP.2a	Count the squares that fill a rectangle drawn on graph paper.
MAFS.2.G.1.3	Partition circles and rectangles into two, three or four equal shares, describe the shares using the words *halves, thirds, half of, a third of,* etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.2.G.1.AP.3a	Partition circles and rectangles into two, three, and four equal parts.
	MAFS.2.G.1.AP.3b	Label a partitioned shape (e.g., one whole rectangle was separated into two halves; one whole circle was separated into three thirds).

GRADE: 3

Domain: OPERATIONS AND ALGEBRAIC THINKING	
Cluster 1: Represent and solve problems involving multiplication and division.	
STANDARD CODE	**STANDARD**
MAFS.3.OA.1.1	Interpret products of whole numbers (e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each). *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.3.OA.1.AP.1a — Find the total number inside an array with neither number in the columns or rows greater than five.
	MAFS.3.OA.1.AP.1b — Solve multiplication problems with neither number greater than five.
	MAFS.3.OA.1.AP.1c — Use objects to model multiplication involving up to five groups with up to five objects in each.
MAFS.3.OA.1.2	Interpret whole-number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.* *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.3.OA.1.AP.2a — Determine the number of sets of whole numbers, five or less, that equal a dividend.
	MAFS.3.OA.1.AP.2b — Use objects to model division situations involving up to five groups, with up to five objects in each group, and interpret the results.
MAFS.3.OA.1.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.3.OA.1.AP.3a — Solve and check one- or two-step word problems requiring multiplication or division with the product or quotient up to 50.
MAFS.3.OA.1.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations* 8 × ? = 48, 5 = [ ] ÷ 3, 6 × 6 = ?. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.3.OA.1.AP.4a — Find the unknown number in a multiplication equation.

Cluster 2: Understand properties of multiplication and the relationship between multiplication and division.	
STANDARD CODE	**STANDARD**

MAFS.3.OA.2.5	Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.OA.2.AP.5a	Recognize multiplication as communicative and associative.
MAFS.3.OA.2.6	Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.OA.2.AP.6a	Model division as the inverse of multiplication for quantities less than 10.

Cluster 3: Multiply and divide within 100.

STANDARD CODE	STANDARD	
MAFS.3.OA.3.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of grade 3, know from memory all products of two one-digit numbers. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.OA.3.AP.7a	Fluently multiply and divide within 20.
	MAFS.3.OA.3.AP.7b	Fluently multiply 2, 5 or 10 within 100.
	MAFS.3.OA.3.AP.7c	Fluently divide by 2, 5, or 10 using dividends within 100 that are multiples of 2, 5, or 10.

Cluster 4: Solve problems involving the four operations, and identify and explain patterns in arithmetic.

STANDARD CODE	STANDARD	
MAFS.3.OA.4.8	Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.OA.4.AP.8a	Solve and check one-step word problems using the four operations within 100.
MAFS.3.OA.4.9	Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that four times a number is always even, and explain why four times a number can be decomposed into two equal addends.* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.3.OA.4.AP.9a	Identify and describe the rule for a numerical pattern where numbers increase by 2, 5 or 10.
	MAFS.3.OA.4.AP.9b	Select or name the three next terms in a numerical pattern where numbers increase by 2, 5 or 10.
	MAFS.3.OA.4.AP.9c	Identify multiplication patterns in a real-world setting.

Domain: NUMBER AND OPERATIONS IN BASE TEN		
Cluster 1: Use place value understanding and properties of operations to perform multi-digit arithmetic.		
STANDARD CODE	**STANDARD**	
MAFS.3.NBT.1.1	Use place value understanding to round whole numbers to the nearest 10 or 100. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.NBT.1.AP.1a	Use place value to round to the nearest 10 or 100.
MAFS.3.NBT.1.2	Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations and/or the relationship between addition and subtraction. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.NBT.1.AP.2a	Use the relationships between addition and subtraction to solve problems.
	MAFS.3.NBT.1.AP.2b	Solve multi-step addition and subtraction problems up to 100.
MAFS.3.NBT.1.3	Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.NBT.1.AP.3a	Multiply one-digit numbers by 10, 20, and 50.

Domain: NUMBER AND OPERATIONS – FRACTIONS		
Cluster 1: Develop understanding of fractions as numbers.		
STANDARD CODE	**STANDARD**	
MAFS.3.NF.1.1	Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.NF.1.AP.1a	Identify the number of highlighted parts (numerator) of a given representation (rectangles and circles).
	MAFS.3.NF.1.AP.1b	Identify the total number of parts (denominator) of a given representation (rectangles and circles).
	MAFS.3.NF.1.AP.1c	Identify the fraction that matches the representation of partitioned rectangles and circles into halves, fourths, thirds, and eighths.
MAFS.3.NF.1.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. Represent a fraction *a/b* on a number line diagram by marking off *a* lengths *1/b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.NF.1.AP.2a	Locate given common unit fractions (i.e., 1/2, 1/4) on a number line or ruler.

MAFS.3.NF.1.3	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent (e.g., by using a visual fraction model.) c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.* d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, = or < and justify the conclusions, e.g., by using a visual fraction model. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.3.NF.1.AP.3a	Identify equivalent fractions on a number line divided into fourths and halves within 3 units.

Domain: MEASUREMENT AND DATA

Cluster 1: Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects.

STANDARD CODE	STANDARD	
MAFS.3.MD.1.1	Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.MD.1.AP.1a	Solve word problems involving the addition and subtraction of time intervals of whole hours or within an hour (whole hours: 5:00 to 8:00, within hours: 7:15 to 7:45) on a number line.
	MAFS.3.MD.1.AP.1b	Determine the equivalence between the number of minutes and the number of hours (e.g., 60 minutes = 1 hour) on a number line.
MAFS.3.MD.1.2	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg) and liters (l). Add, subtract, multiply or divide to solve one-step word problems involving masses or volumes that are given in the same units. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.MD.1.AP.2a	Select the appropriate tool for the measurement of liquid volume and mass.
	MAFS.3.MD.1.AP.2b	Select appropriate units for measurement involving liquid volume and mass.
	MAFS.3.MD.1.AP.2c	Add to solve one-step word problems involving liquid volume and mass.
	MAFS.3.MD.1.AP.2d	Estimate liquid volume and mass.

Cluster 2: Represent and interpret data.

STANDARD CODE	STANDARD
MAFS.3.MD.2.3	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent five pets.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

	ACCESS POINTS	
	MAFS.3.MD.2.AP.3a	Collect data and organize into a picture or bar graph.
	MAFS.3.MD.2.AP.3b	Select the appropriate statement that compares the data representations based on a given graph (picture, bar, line plots).
MAFS.3.MD.2.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves or quarters. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.3.MD.2.AP.4a	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.
	MAFS.3.MD.2.AP.4b	Organize measurement data into a line plot.

Cluster 3: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

STANDARD CODE	STANDARD	
MAFS.3.MD.3.5	Recognize area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area. b. A plane figure that can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.MD.3.AP.5a	Use tiling to determine area.
MAFS.3.MD.3.6	Measure areas by counting unit squares (square cm, square m, square in, square ft and improvised units). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.3.MD.3.AP.6a	Measure area of rectangles by counting unit squares.
MAFS.3.MD.3.7	Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning. d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.3.MD.3.AP.7a	Use tiling and repeated addition to determine area.

Cluster 4: Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

STANDARD CODE	STANDARD
MAFS.3.MD.4.8	Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length and exhibiting rectangles with the same perimeter and different areas, or with the same area and different perimeters. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.3.MD.4.AP.8a — Use addition to find the perimeter of a rectangle.
	MAFS.3.MD.4.AP.8b — Draw different rectangles with the same area but different perimeters on graph paper.

Domain: GEOMETRY

Cluster 1: Reason with shapes and their attributes.

STANDARD CODE	STANDARD
MAFS.3.G.1.1	Understand that shapes in different categories (e.g., rhombuses, rectangles and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.3.G.1.AP.1a — Identify the attributes of quadrilaterals.
	MAFS.3.G.1.AP.1b — Identify different examples of quadrilaterals.
MAFS.3.G.1.2	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into four parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.3.G.1.AP.2a — Partition a rectangle into equal parts with equal area.

GRADE: 4

Domain: OPERATIONS AND ALGEBRAIC THINKING

Cluster 1: Use the four operations with whole numbers to solve problems.

STANDARD CODE	STANDARD
MAFS.4.OA.1.1	Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS

	MAFS.4.OA.1.AP.1a	Use objects to model multiplication involving up to five groups with up to five objects in each and write equations to represent the models.
MAFS.4.OA.1.2	Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.OA.1.AP.2a	Solve multiplicative comparisons with an unknown using up to two-digit numbers with information presented in a graph or word problem (e.g., an orange hat costs $3. A purple hat costs two times as much. How much does the purple hat cost? [3 x 2 = p]).
	MAFS.4.OA.1.AP.2b	Determine the number of sets of whole numbers, ten or less, that equal a dividend.
MAFS.4.OA.1.3	Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.OA.1.AP.3a	Solve and check one- or two-step word problems requiring the four operations within 100.
MAFS.4.OA.1.a	Determine whether an equation is true or false by using comparative relational thinking. For example, without adding 60 and 24, determine whether the equation 60 + 24 = 57 + 27 is true or false.	
	ACCESS POINTS	
	MAFS.4.OA.1.AP.aa	Determine whether an equation with quantities less than 100 is true or false.
MAFS.4.OA.1.b	Determine the unknown whole number in an equation relating four whole numbers using comparative relational thinking. For example, solve 76 + 9 = n + 5 for n by arguing that 9 is 4 more than 5, so the unknown number must be 4 greater than 76.	
	ACCESS POINTS	
	MAFS.4.OA.1.AP.ba	Find the unknown number in an equation (+, -) relating four whole numbers.

Cluster 2: Gain familiarity with factors and multiples.

STANDARD CODE	STANDARD	
MAFS.4.OA.2.4	Investigate factors and multiples. a. Find all factor pairs for a whole number in the range 1–100. b. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. c. Determine whether a given whole number in the range 1–100 is prime or composite. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.OA.2.AP.4a	Identify multiples for a whole number (e.g., The multiples of 2 are 2, 4, 6, 8, 10…).
	MAFS.4.OA.2.AP.4b	Identify factors of whole numbers within 30.

Cluster 3: Generate and analyze patterns.

STANDARD CODE	STANDARD
MAFS.4.OA.3.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3"*

	and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.OA.3.AP.5a	Generate a pattern when given a rule.
	MAFS.4.OA.3.AP.5b	Extend a numerical pattern when the rule is provided.

Domain: NUMBER AND OPERATIONS IN BASE TEN

Cluster 1: Generalize place value understanding for multi-digit whole numbers.

STANDARD CODE	STANDARD	
MAFS.4.NBT.1.1	Recognize that, in a multi-digit whole number, a digit in one place represents 10 times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.4.NBT.1.AP.1a	Compare the value of a digit when it is represented in a different place of two three-digit numbers (e.g., The digit 2 in 124 is ten times the digit 2 in 472).
MAFS.4.NBT.1.2	Read and write multi-digit whole numbers using base-ten numerals, number names and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, = and < symbols to record the results of comparisons. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.NBT.1.AP.2a	Compare multi-digit numbers.
	MAFS.4.NBT.1.AP.2b	Write or select the expanded form for a multi-digit number.
	MAFS.4.NBT.1.AP.2c	Understand the role of commas to read and write numerals between 1,000 and 1,000,000.
MAFS.4.NBT.1.3	Use place value understanding to round multi-digit whole numbers to any place. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.4.NBT.1.AP.3a	Use a hundreds chart or number line to round to any place (i.e., ones, tens, hundreds, thousands).

Cluster 2: Use place value understanding and properties of operations to perform multi-digit arithmetic.

STANDARD CODE	STANDARD	
MAFS.4.NBT.2.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.4.NBT.2.AP.4a	Solve multi-digit addition and subtraction problems within 1,000.
MAFS.4.NBT.2.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of	

	operations. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.NBT.2.AP.5a — Solve a two-digit by one-digit whole number multiplication problem using two different strategies.
MAFS.4.NBT.2.6	Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.NBT.2.AP.6a — Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors, using two different strategies.

Domain: NUMBER AND OPERATIONS – FRACTIONS

Cluster 1: Extend understanding of fraction equivalence and ordering.

STANDARD CODE	STANDARD
MAFS.4.NF.1.1	Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.4.NF.1.AP.1a — Determine equivalent fractions using visual fraction models and a number line.
MAFS.4.NF.1.2	Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, = or < and justify the conclusions, e.g., by using a visual fraction model. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.NF.1.AP.2a — Use =, < or > to compare two fractions (fractions with a denominator or 10 or less).
	MAFS.4.NF.1.AP.2b — Compare 2 given fractions that have different denominators.

Cluster 2: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

STANDARD CODE	STANDARD
MAFS.4.NF.2.3	Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations

	and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.4.NF.2.AP.3a	Using a representation, decompose a fraction into multiple copies of a unit fraction (e.g., ¾=1/4 + 1/4+ 1/4).
MAFS.4.NF.2.AP.3b	Add and subtract fractions with like denominators (2, 3, 4 or 8) using representations.
MAFS.4.NF.2.AP.3c	Solve word problems involving addition and subtraction of fractions with like denominators (2, 3, 4 or 8).

MAFS.4.NF.2.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.4.NF.2.AP.4a	Multiply a fraction by a whole number using a visual fraction model.

Cluster 3: Understand decimal notation for fractions and compare decimal fractions.

STANDARD CODE	STANDARD
MAFS.4.NF.3.5	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* *Cognitive Complexity:* Level 1: Recall

ACCESS POINTS	
MAFS.4.NF.3.AP.5a	Find the equivalent fraction with denominators that are multiples of 10.

MAFS.4.NF.3.6	Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* *Cognitive Complexity:* Level 1: Recall

ACCESS POINTS	
MAFS.4.NF.3.AP.6a	Identify the equivalent decimal form for a benchmark fraction.
MAFS.4.NF.3.AP.6b	Match a fraction (with a denominator of 10 or 100) with its decimal equivalent (5/10 = 0.5).
MAFS.4.NF.3.AP.6c	Read, write or select decimals to the tenths place.
MAFS.4.NF.3.AP.6d	Read, write or select decimals to the hundredths place.

MAFS.4.NF.3.7	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, = or <, and justify the conclusions, e.g., by using a visual model. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS

	MAFS.4.NF.3.AP.7a	Use =, < or > to compare two decimals (decimals in multiples of .10).
	MAFS.4.NF.3.AP.7b	Compare two decimals expressed to the tenths place with a value of less than 1 using a visual model.
	MAFS.4.NF.3.AP.7c	Compare two decimals expressed to the hundredths place with a value of less than 1 using a visual model.

Domain: MEASUREMENT AND DATA

Cluster 1: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

STANDARD CODE	STANDARD	
MAFS.4.MD.1.1	Know relative sizes of measurement units within one system of units, including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4-ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), etc.* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.4.MD.1.AP.1a	Within a system of measurement, identify the number of smaller units in the next larger unit.
	MAFS.4.MD.1.AP.1a	Complete a conversion table for length and mass within a single system.
MAFS.4.MD.1.2	Use the four operations to solve word problems involving distances, intervals of time and money, including problems involving simple fractions or decimals. Represent fractional quantities of distance and intervals of time using linear models. (1 See glossary Table 1 and Table 2) (2 Computational fluency with fractions and decimals is not the goal for students at this grade level.) *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.MD.1.AP.2a	Solve word problems involving distance using line plots.
MAFS.4.MD.1.3	Apply the area and perimeter formulas for rectangles in real--world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.MD.1.AP.3a	Solve word problems involving perimeter and area of rectangles using specific visualizations/drawings and numbers.

Cluster 2: Represent and interpret data.

STANDARD CODE	STANDARD	
MAFS.4.MD.2.4	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.4.MD.2.AP.4a	Solve problems involving addition and subtraction of fractions with like denominators (2, 4, and 8) by using information presented in line plots.

Cluster 3: Geometric measurement: understand concepts of angle and measure angles.

STANDARD CODE	STANDARD
MAFS.4.MD.3.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle" and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.4.MD.3.AP.5a — Identify an angle in a two-dimensional figure.
MAFS.4.MD.3.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.MD.3.AP.6a — Sketch angles of specific measures.
	MAFS.4.MD.3.AP.6b — Identify types of angles.
MAFS.4.MD.3.7	Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.MD.3.AP.7a — Find sums of angles that show a ray (adjacent angles).

Domain: GEOMETRY

Cluster 1: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

STANDARD CODE	STANDARD
MAFS.4.G.1.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines. Identify these in two-dimensional figures. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.4.G.1.AP.1a — Identify a point, line and line segment and rays in two-dimensional figures.
	MAFS.4.G.1.AP.1b — Identify perpendicular and parallel lines in a two-dimensional figure.
	MAFS.4.G.1.AP.1c — Identify an angle in a two-dimensional figure.
MAFS.4.G.1.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

	ACCESS POINTS
	MAFS.4.G.1.AP.2a — Identify and sort objects based on parallelism, perpendicularity, and angle type.
MAFS.4.G.1.3	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.4.G.1.AP.3a — Identify figures that have a line of symmetry.

GRADE: 5

Domain: OPERATIONS AND ALGEBRAIC THINKING

Cluster 1: Write and interpret numerical expressions.

STANDARD CODE	STANDARD
MAFS.5.OA.1.1	Use parentheses, brackets or braces in numerical expressions, and evaluate expressions with these symbols. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.OA.1.AP.1a — Evaluate a simple expression involving one set of parenthesis.
MAFS.5.OA.1.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.OA.1.AP.2a — Write a simple expression for a calculation.

Cluster 2: Analyze patterns and relationships.

STANDARD CODE	STANDARD
MAFS.5.OA.2.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.5.OA.2.AP.3a	Given two pattern descriptions involving the same context (e.g., collecting marbles), determine the first five terms and compare the values. Day / Joe / Kim 0 / 0 / 0 1 / 2 / 4 2 / 4 / 8 3 / 6 / 12 4 / 8 / 16 5 / 10 / 20
	MAFS.5.OA.2.AP.3b	Graph ordered pairs on a coordinate plane when given a table that follows patterns rules.

Domain: NUMBER AND OPERATIONS IN BASE TEN

Cluster 1: Understand the place value system.

STANDARD CODE	STANDARD
MAFS.5.NBT.1.1	Recognize that, in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.NBT.1.AP.1a — Compare the value of a number when it is represented in different place values of two three-digit numbers.
MAFS.5.NBT.1.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.5.NBT.1.AP.2a — Identify what an exponent represents (e.g., 10^3= 10X10X10).
	MAFS.5.NBT.1.AP.2b — Identify the direction the decimal point will move when multiplying or diving by a multiple of 10.
MAFS.5.NBT.1.3	Read, write and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1,000). b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, = and < symbols to record the results of comparisons. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.5.NBT.1AP.3a — Read, write, or select a decimal to the hundredths place.

	MAFS.5.NBT.1.AP.3b	Compare two decimals to the hundredths place, whose values are less than 1.
MAFS.5.NBT.1.4	Use place value understanding to round decimals to any place. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.5.NBT.1.AP.4a	Round decimals to the nearest whole number.
	MAFS.5.NBT.1.AP.4b	Round decimals to the tenths place.
	MAFS.5.NBT.1.AP.4c	Round decimals to the hundredths place.

Cluster 2: Perform operations with multi-digit whole numbers and with decimals to hundredths.

STANDARD CODE	STANDARD	
MAFS.5.NBT.2.5	Fluently multiply multi-digit whole numbers using the standard algorithm. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.5.NBT.2.AP.5a	Fluently multiply two-digit numbers.
MAFS.5.NBT.2.6	Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NBT.2.AP.6a	Find whole number quotients up to two dividends and two divisors.
	MAFS.5.NBT.2.AP.6b	Find whole number quotients of whole numbers with up to two-digit dividends and two-digit divisors.
MAFS.5.NBT.2.7	Add, subtract, multiply and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NBT.2.AP.7a	Solve one-step problems using decimals.

Domain: NUMBER AND OPERATIONS - FRACTIONS

Cluster 1: Use equivalent fractions as a strategy to add and subtract fractions.

STANDARD CODE	STANDARD	
MAFS.5.NF.1.1	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd).* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.1.AP.1a	Add and subtract fractions with like denominators with sums greater than 1 represented by mixed numbers using visual fraction models.

	MAFS.5.NF.1.AP.1b	Add or subtract fractions with unlike denominators within one whole unit on a number line.
MAFS.5.NF.1.2	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.1.AP.2a	Solve word problems involving the addition and subtraction of fractions using visual fraction models.

Cluster 2: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

STANDARD CODE	STANDARD	
MAFS.5.NF.2.3	Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.2.AP.3a	Divide unit fractions by whole numbers and whole numbers by unit fractions using visual fraction models.
MAFS.5.NF.2.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product *(a/b) × q* as a parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a × q ÷ b*. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.2.AP.4a	Multiply a fraction by a whole or mixed number using visual fraction models.
MAFS.5.NF.2.5	Interpret multiplication as scaling (resizing) by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence *a/b = (n×a)/(n×b)* to the effect of multiplying *a/b* by 1. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.5.NF.2.AP.5a	Determine whether the product will increase or decrease based on the multiple using visual fraction models.
MAFS.5.NF.2.6	Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.2.AP.6a	Multiply a fraction by a whole or mixed number using visual fraction models.

MAFS.5.NF.2.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.NF.2.AP.7a	Divide unit fractions by whole numbers and whole numbers by unit fractions using visual fraction models.

Domain: MEASUREMENT AND DATA

Cluster 1: Convert like measurement units within a given measurement system.

STANDARD CODE	STANDARD	
MAFS.5.MD.1.1	Convert among different-sized standard measurement units (i.e., km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec) within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.MD.1.AP.1a	Convert standard measurements of time to solve real-world problems.
	MAFS.5.MD.1.AP.1b	Convert standard measurements of length to solve real-world problems.
	MAFS.5.MD.1.AP.1c	Convert standard measurements of mass to solve real-world problems.

Cluster 2: Represent and interpret data.

STANDARD CODE	STANDARD	
MAFS.5.MD.2.2	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.MD.2.AP.2a	Collect and graph fractional data on a line plot (e.g., length of each person's pencil in classroom, hours of exercise each week).

Cluster 3: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

STANDARD CODE	STANDARD
MAFS.5.MD.3.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume. b. A solid figure that can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.MD.3.AP.3a — Use packing to recognize volume of a solid figure.
MAFS.5.MD.3.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft and improvised units. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.MD.3.AP.4a — Determine the volume of a rectangular prism built by “unit cubes.”
MAFS.5.MD.3.5	Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. b. Apply the formulas V = l x w x h and V= B x h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.5.MD.3.AP.5a — Use multiplication to represent each layer of the rectangular prism.
	MAFS.5.MD.3.AP.5b — Use addition to determine the length, width, and height.
	MAFS.5.MD.3.AP.5c — Connect the layers to the dimensions and multiply to find the volume of the rectangular prism.

Domain: GEOMETRY

Cluster 1: Graph points on the coordinate plane to solve real-world and mathematical problems.

STANDARD CODE	STANDARD
MAFS.5.G.1.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.5.G.1.AP.1a — Locate the x- and y-axis on a coordinate plane.
	MAFS.5.G.1.AP.1b — Locate points on a coordinate plane.

	MAFS.5.G.1.AP.1c	Graph ordered pairs (coordinates).
MAFS.5.G.1.2	Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.G.1.AP.2a	Find a location on a map using given coordinates.

Cluster 2: Classify two-dimensional figures into categories based on their properties.

STANDARD CODE	STANDARD	
MAFS.5.G.2.3	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.G.2.AP.3a	Recognize properties of simple plane figures using polygon-shaped manipulatives.
MAFS.5.G.2.4	Classify two-dimensional figures in a hierarchy based on properties. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.5.G.2.AP.4a	Use polygon-shaped manipulatives to classify and organize two-dimensional figures into Venn diagrams based on the attributes of the figures.

GRADE: 6

Domain: RATIOS & PROPORTIONAL RELATIONSHIPS

Cluster 1: Understand ratio concepts and use ratio reasoning to solve problems.

STANDARD CODE	STANDARD	
MAFS.6.RP.1.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.RP.1.AP.1a	Write or select a ratio to match a given statement and representation.
	MAFS.6.RP.1.AP.1b	Describe the ratio relationship between two quantities for a given situation using visual representations.
MAFS.6.RP.1.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	

	ACCESS POINTS	
	MAFS.6.RP.1.AP.2a	Determine the unit rate in a variety of contextual situations
MAFS.6.RP.1.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve unit rate problems, including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? c. Find a percentage of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percentage. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. e. Understand the concept of Pi as the ratio of the circumference of a circle to its diameter. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.RP.1.AP.3a	Use ratios and reasoning to solve real-world mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
	MAFS.6.RP.1.AP.3b	Solve unit rate problems involving unit pricing using whole numbers.
	MAFS.6.RP.1.AP.3c	Solve one-step real-world measurement problems involving whole number unit rates when given the unit rate (“Three inches of snow falls per hour, how much falls in six hours?”).
	MAFS.6.RP.1.AP.3d	Calculate a percentage of a quantity as rate per 100 using models (e.g., percent bars or 10 x 10 grids).
Domain: THE NUMBER SYSTEM		
Cluster 1: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.		
STANDARD CODE	**STANDARD**	
MAFS.6.NS.1.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.NS.1.AP.1a	Divide fractions using visual fraction models.
Cluster 2: Compute fluently with multi-digit numbers and find common factors and multiples.		
STANDARD CODE	**STANDARD**	
MAFS.6.NS.2.2	Fluently divide multi-digit numbers using the standard algorithm. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	

	MAFS.6.NS.2.AP.2a	Divide multi-digit whole numbers by a single-digit number.
	MAFS.6.NS.2.AP.2b	Divide multi-digit whole numbers by a two-digit number with the quotient having no remainders.
MAFS.6.NS.2.3	Fluently add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.6.NS.2.AP.3a	Solve one-step, addition, subtraction, multiplication, or division problems involving decimals whose place value ranges from the thousand to the thousandths places.
MAFS.6.NS.2.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.NS.2.AP.4a	Find the greatest common factor of two numbers that are less than or equal to 50.
	MAFS.6.NS.2.AP.4b	Find the least common multiple of two whole numbers that are less than or equal to 10.
	MAFS.6.NS.2.AP.4c	Use the distributive property to express the sum of two whole numbers.
Cluster 3: Apply and extend previous understandings of numbers to the system of rational numbers.		
STANDARD CODE	**STANDARD**	
MAFS.6.NS.3.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.NS.3.AP.5a	Represent positive or negative numbers on a number line given a real-world situation.
MAFS.6.NS.3.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.NS.3.AP.6a	Find given points between -10 and 10 on both axes of a coordinate plane.
	MAFS.6.NS.3.AP.6b	Label points between -10 and 10 on both axes of a coordinate plane.
	MAFS.6.NS.3.AP.6c	Identify numbers as positive or negative.
	MAFS.6.NS.3.AP.6d	Locate positive and negative numbers on a number line.
	MAFS.6.NS.3.AP.6e	Plot positive and negative numbers on a number line.
MAFS.6.NS.3.7	Understand ordering and absolute value of rational numbers.	

	a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* b. Write, interpret and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ºC > –7 ºC to express the fact that –3 ºC is warmer than –7 ºC.* c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS MAFS.6.NS.3.AP.7a: Compare two numbers on a number line (e.g., –2 > –9) between -30 and 30. MAFS.6.NS.3.AP.7b: Determine the meaning of absolute value using numbers from -30 to 30.
MAFS.6.NS.3.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS MAFS.6.NS.3.AP.8a: Graph or identify points in all four quadrants of the coordinate plane, given a coordinate plane on graph paper. MAFS.6.NS.3.AP.8b: Given two points plotted on a coordinate plane, find the distance between two points on a coordinate plane.

Domain: EXPRESSIONS & EQUATIONS

Cluster 1: Apply and extend previous understandings of arithmetic to algebraic expressions.

STANDARD CODE	STANDARD
MAFS.6.EE.1.1	Write and evaluate numerical expressions involving whole-number exponents. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS MAFS.6.EE.1.AP.1a: Solve numerical expressions involving whole-number bases and exponents (e.g., $5 + 2^4 \times 6 = 101$) MAFS.6.EE.1.AP.1b: Identify what an exponent represents (e.g., $8^3 = 8 \times 8 \times 8$).
MAFS.6.EE.1.2	Write, read and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.6.EE.1.AP.2a	Write or select an algebraic expression that represents a real-world situation.
MAFS.6.EE.1.3	Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.6.EE.1.AP.3a	Use properties to produce equivalent expressions.
MAFS.6.EE.1.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number, regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number, regardless of which number y stands for.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.EE.1.AP.4a	Evaluate whether sides of an equation are equal using models.

Cluster 2: Reason about and solve one-variable equations and inequalities.

STANDARD CODE	STANDARD	
MAFS.6.EE.2.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.EE.2.AP.5a	Evaluate whether both sides of an equation are equal using models.
	MAFS.6.EE.2.AP.5b	Solve an equation using substitution.
	MAFS.6.EE.2.AP.5c	Solve an inequality using substitution (e.g., given a budget, a student will select a number [specified set] to remain within budget).
MAFS.6.EE.2.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.6.NS.2.AP.6a	Use a variable to represent numbers and write expressions when solving real-world problems.
MAFS.6.EE.2.7	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all non-negative rational numbers. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.EE.2.AP.7a	Solve problems or word problems using equations for cases in which the quantities in the problem are positive rational numbers.
	MAFS.6.EE.2.AP.7b	Solve real-world, single-step linear equations involving positive rational numbers.
MAFS.6.EE.2.8	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.EE.2.AP.8a	Write an inequality that represents a real-world situation.

Cluster 3: Represent and analyze quantitative relationships between dependent and independent variables.

STANDARD CODE	STANDARD
MAFS.6.EE.3.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.6.EE.3.AP.9a: Write an equation using variables to represent two quantities where one variable represents the dependent variable and the second represents the independent variable.
	MAFS.6.EE.3.AP.9b: Write an expression that illustrates the relationship between two variables from a provided table.

Domain: GEOMETRY

Cluster 1: Solve real-world and mathematical problems involving area, surface area and volume.

STANDARD CODE	STANDARD
MAFS.6.G.1.1	Find the area of right triangles, other triangles, special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.6.G.1.AP.1a: Compose rectangles to find areas of right triangles using graph paper.
	MAFS.6.G.1.AP.1b: Decompose complex shapes (polygon, trapezoid, and pentagon) into simple shapes (rectangles, squares, triangles) to measure area.
	MAFS.6.G.1.AP.1c: Find the area of quadrilaterals using models.
MAFS.6.G.1.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.6.G.1.AP.2a: Find the fractional length and volume of a rectangular prism with edges using models.
MAFS.6.G.1.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.6.G.1.AP.3a: Draw polygons on a coordinate plane given the coordinates of the vertices.
	MAFS.6.G.1.AP.3b: Use coordinates to find the side lengths of polygons drawn in quadrant I of a coordinate plane.
MAFS.6.G.1.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the

	context of solving real-world and mathematical problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.G.1.AP.4a	Match a two-dimensional net to its corresponding three-dimensional figure.
	MAFS.6.G.1.AP.4b	Find the surface area of the three dimensional figure by adding the areas of the shapes forming the two-dimensional nets.

Domain: STATISTICS & PROBABILITY

Cluster 1: Develop understanding of statistical variability.

STANDARD CODE	STANDARD	
MAFS.6.SP.1.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.6.SP.1.AP.1a	Identify statistical questions and make a plan for data collection.
MAFS.6.SP.1.2	Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread and overall shape. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.SP.1.AP.2a	Find the range of a given data set.
	MAFS.6.SP.1.AP.2b	Explain or identify what the mode represents in a set of data.
MAFS.6.SP.1.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.6.SP.1.AP.3a	Solve for mean of a given data set using whole numbers.
	MAFS.6.SP.1.AP.3b	Explain or identify what the mean represents in a set of data.

Cluster 2: Summarize and describe distributions.

STANDARD CODE	STANDARD	
MAFS.6.SP.2.4	Display numerical data in plots on a number line, including dot plots, histograms and box plots. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.6.SP.2.AP.4a	Display data on a line plot, such as dot plots, histograms or box plots.
MAFS.6.SP.2.5	Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations.	

	b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning

ACCESS POINTS	
MAFS.6.SP.2.AP.5a	Collect real-world data by surveying.
MAFS.6.SP.2.AP.5b	Plot the data.
MAFS.6.SP.2.AP.5c	Define the mean, mode, and range of the data.

GRADE: 7

Domain: RATIOS & PROPORTIONAL RELATIONSHIPS

Cluster 1: Analyze proportional relationships and use them to solve real-world and mathematical problems.

STANDARD CODE	STANDARD
MAFS.7.RP.1.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.RP.1.AP.1a	Solve one-step problems involving unit rates associated with ratios of fractions.

MAFS.7.RP.1.2	Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.* d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.RP.1.AP.2a	Identify the rate of change/proportional relationship of a linear equation that has been plotted as a line on a coordinate plane.
MAFS.7.RP.1.AP.2b	Identify lines plotted on a coordinate plane that represent a proportional relationship.

MAFS.7.RP.1.3	Use proportional relationships to solve multi-step ratio and percentage problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percentage increase and decrease, percentage error.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

	ACCESS POINTS	
	MAFS.7.RP.1.AP.3a	Solve word problems involving ratios.
	MAFS.7.RP.1.AP.3b	Find percentages in real-world contexts.

Domain: THE NUMBER SYSTEM

Cluster 1: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.

STANDARD CODE	STANDARD
MAFS.7.NS.1.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. d. Apply properties of operations as strategies to add and subtract rational numbers. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.NS.1.AP.1a	Identify rational numbers that are an equal distance from 0 on a number line as additive inverses.
MAFS.7.NS.1.AP.1b	Find the distance between two rational numbers on a number line.

MAFS.7.NS.1.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts. Apply properties of operations as strategies to multiply and divide rational numbers. c. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.NS.1.AP.2a	Solve single-digit rational number multiplication problems using a number line.
MAFS.7.NS.1.AP.2b	Solve division problems with quotients from -100 to 100 using a number line.
MAFS.7.NS.1.AP.2c	Write equations to represent rational number multiplication and division problems solved on a number line and generate rules for the products

		and quotients of rational numbers.
MAFS.7.NS.1.3	Solve real-world and mathematical problems involving the four operations with rational numbers. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.NS.1.AP.3a	Solve real-world and mathematical problems involving the four operations with rational numbers from -100 to 100.

Domain: EXPRESSIONS & EQUATIONS

Cluster 1: Use properties of operations to generate equivalent expressions.

STANDARD CODE	STANDARD	
MAFS.7.EE.1.1	Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.7.EE.1.AP.1a	Add and subtract linear expressions that include like terms.
	MAFS.7.EE.1.AP.1b	Factor and expand linear expressions.
MAFS.7.EE.1.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.EE.1.AP.2a	Combine like terms in an expression.

Cluster 2: Solve real-world and mathematical problems using numerical and algebraic expressions and equations.

STANDARD CODE	STANDARD	
MAFS.7.EE.2.3	Solve multi-step real-world and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.EE.2.AP.3a	Solve real-world, multi-step problems using positive and negative rational numbers (whole numbers, fractions and decimals).
MAFS.7.EE.2.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a*	

	rectangle is 54 cm. Its length is 6 cm. What is its width? b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.EE.2.AP.4a	Set up equations with one variable based on real-world problems.
MAFS.7.EE.2.AP.4b	Solve equations with one variable based on real-world problems.

Domain: GEOMETRY

Cluster 1: Draw, construct and describe geometrical figures and describe the relationships between them.

STANDARD CODE	STANDARD
MAFS.7.G.1.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.G.1.AP.1a	Draw pairs of proportional polygons on graph paper.
MAFS.7.G.1.AP.1b	Draw a scale drawing of a real-world two-dimensional polygon on graph paper.

MAFS.7.G.1.2	Draw (freehand, with ruler and protractor and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle or no triangle. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.G.1.AP.2a	Construct or draw plane figures using properties.

MAFS.7.G.1.3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.7.G.1.AP.3a	Identify the two-dimensional polygons that result from slicing a three-dimensional prism.

Cluster 2: Solve real-world and mathematical problems involving angle measure, area, surface area and volume.

STANDARD CODE	STANDARD
MAFS.7.G.2.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS

	MAFS.7.G.2.AP.4a	Estimate the area of a circle using graph paper.
	MAFS.7.G.2.AP.4b	Measure the circumference of a circle using string.
MAFS.7.G.2.5	Use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.G.2.AP.5a	Given equal fractional parts of a circle (up to 8), find the measure of a central angle.
	MAFS.7.G.2.AP.5b	Find the measure of a missing angle inside a triangle.
	MAFS.7.G.2.AP.5c	Find the measure of a missing angle in a linear pair.
	MAFS.7.G.2.AP.5d	Identify vertical angles using visual models and find their measures.
MAFS.7.G.2.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.G.2.AP.6a	Add the area of each face of a prism to find the surface area of three-dimensional objects.
	MAFS.7.G.2.AP.6b	Solve one-step, real-world measurement problems involving area, volume or surface area of two- and three-dimensional objects.

Domain: STATISTICS & PROBABILITY

Cluster 1: Use random sampling to draw inferences about a population.

STANDARD CODE	STANDARD	
MAFS.7.SP.1.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.SP.1.AP.1a	Survey a sample population to generate data that represents the total population.
MAFS.7.SP.1.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.7.SP.1.AP.2a	Collect data from a sample size of the population, graph the data, and make inferences about the population based on the data.

Cluster 2: Draw informal comparative inferences about two populations.

STANDARD CODE	STANDARD
MAFS.7.SP.2.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.SP.2.AP.3a	Given graphed distributions of two sets of data, make statements comparing the two sets of data.
MAFS.7.SP.2.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.SP.2.AP.4a	Identify the range (difference), median (middle), mean (average), or mode (most frequent) of two sets of data.
	MAFS.7.SP.2.AP.4b	Make or select an appropriate statement based upon two unequal data sets using measure of central tendency and shape of the distribution.

Cluster 3: Investigate chance processes and develop, use and evaluate probability models.

STANDARD CODE	STANDARD	
MAFS.7.SP.3.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely and a probability near 1 indicates a likely event. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.7.SP.3.AP.5a	Define the probability of related events given a situation of chance.
MAFS.7.SP.3.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.7.SP.3.AP.6a	Make a prediction regarding the probability of an event occurring; conduct simple probability experiments and compare results to predictions.
MAFS.7.SP.3.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.7.SP.3.AP.7a	Compare actual results of a simple experiment when numbers of instances are increased.
MAFS.7.SP.3.8	Find probabilities of compound events using organized lists, tables, tree diagrams and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space that compose the event. c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	

	MAFS.7.SP.3.AP.8a	Determine the theoretical probability of compound events (e.g., two coins or two dice).
	MAFS.7.SP.3.AP.8b	Use tree diagrams, frequency tables, organized lists, and/or simulations to collect data from a two-step simulation of compound events (using two coins and/or two dice).

GRADE: 8

Domain: THE NUMBER SYSTEM

Cluster 1: Know that there are numbers that are not rational, and approximate them by rational numbers.

STANDARD CODE	STANDARD	
MAFS.8.NS.1.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers, show that the decimal expansion repeats eventually, and convert a decimal expansion that repeats eventually into a rational number. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.8.NS.1.AP.1a	Distinguish between rational and irrational numbers. Show that any number that can be expressed as a fraction is a rational number.
	MAFS.8.NS.1.AP.1b	Using whole number dividends from 8 to 20 and odd whole number divisors from 3 to 7, identify irrational decimal quotients.
	MAFS.8.NS.1.AP.1c	Round irrational quotients to the hundredths place.
MAFS.8.NS.1.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.NS.1.AP.2a	Locate approximations of irrational numbers on a number line.

Domain: EXPRESSIONS & EQUATIONS

Cluster 1: Work with radicals and integer exponents.

STANDARD CODE	STANDARD	
MAFS.8.EE.1.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3}$ $=1/3^3=1/27$* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.8.EE.1.AP.1a	Use properties of integer exponents to produce equivalent expressions.
MAFS.8.EE.1.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. *Cognitive Complexity:* Level 1: Recall	

	ACCESS POINTS	
	MAFS.8.EE.1.AP.2a	Use appropriate tools to calculate square root and cube root.
	MAFS.8.EE.1.AP.2b	Find products when bases from -6 to 6 are squared and cubed, using a calculator.
	MAFS.8.EE.1.AP.2c	Identify perfect squares from 0 to100 by modeling them on graph paper or building with tiles.
	MAFS.8.EE.1.AP.2d	Identify squares and cubes as perfect or non-perfect.
	MAFS.8.EE.1.AP.2e	Recognize that non-perfect squares/cubes are irrational.
MAFS.8.EE.1.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × and the population of the world as 7 × , and determine that the world population is more than 20 times larger.* *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.8.EE.1.AP.3a	Multiply single digits by the power of 10 using a calculator.
	MAFS.8.EE.1.AP.3b	Identify the products of powers of 10 (through 10^8).
MAFS.8.EE.1.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.EE.1.AP.4a	Perform operations with numbers expressed in scientific notation using a calculator.

Cluster 2: Understand the connections between proportional relationships, lines and linear equations.

STANDARD CODE	STANDARD	
MAFS.8.EE.2.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.EE.2.AP.5a	Define rise/run (slope) for linear equations plotted on a coordinate plane.
MAFS.8.EE.2.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.EE.2.AP.6a	Define y = mx by identifying the coordinates (x, y) of a point and rise/run (m) for a linear equation plotted on a coordinate plane that passes through the origin.

Cluster 3: Analyze and solve linear equations and pairs of simultaneous linear equations.

STANDARD CODE	STANDARD
MAFS.8.EE.3.7	Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a or a = b results (where a and b are different numbers).

	b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.8.EE.3.AP.7a	Simplify linear equations and solve for one variable.

MAFS.8.EE.3.8	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.8.EE.3.AP.8a	Identify the coordinates of the point of intersection for two linear equations plotted on a coordinate plane.
MAFS.8.EE.3.AP.8b	Given two sets of coordinates for two lines, plot the lines on a coordinate plane and define the rise/run (m) for each line to determine if the lines will intersect or not.

Domain: FUNCTIONS

Cluster 1: Define, evaluate and compare functions.

STANDARD CODE	STANDARD
MAFS.8.F.1.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.8.F.1.AP.1a	Graph the points of a function given the rule of a simple function and identifying four values of x and y.

MAFS.8.F.1.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.8.F.1.AP.2a	Compare the rise/run (m) of two simple linear functions.

MAFS.8.F.1.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.8.F.1.AP.3a	Identify graphed functions as linear or not linear.

Cluster 2: Use functions to model relationships between quantities.

STANDARD CODE	STANDARD
MAFS.8.F.2.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.8.F.2.AP.4a — Identify rise/run (m) as slope and identify the coordinates of the y-intercept.
MAFS.8.F.2.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or non-linear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.8.F.2.AP.5a — Sketch a graph that exhibits the slope and y-intercept provided.
	MAFS.8.F.2.AP.5b — Identify the slope coordinates of one point and the y-intercept.
	MAFS.8.F.2.AP.5c — Describe or select the relationship between two plotted graphs.

Domain: GEOMETRY

Cluster 1: Understand congruence and similarity using physical models, transparencies or geometry software.

STANDARD CODE	STANDARD
MAFS.8.G.1.1	Verify experimentally the properties of rotations, reflections and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.8.G.1.AP.1a — Perform rotations, reflections, and translations using pattern blocks.
	MAFS.8.G.1.AP.1b — Draw rotations, reflections, and translations of polygons.
MAFS.8.G.1.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.8.G.1.AP.2a — Demonstrate that two-dimensional polygons that are rotated, reflected, or translated are still congruent using area, perimeter, and length of sides on a coordinate plane.
MAFS.8.G.1.3	Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.8.G.1.AP.3a	Dilate common polygons using graph paper and identifying the coordinates of the vertices.
	MAFS.8.G.1.AP.3b	Given two figures on a coordinate plane, identify if the image is dilated, translated, rotated, or reflected.
MAFS.8.G.1.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.G.1.AP.4a	Recognize congruent and similar figures.
	MAFS.8.G.1.AP.4b	Identify two-dimensional figures as similar or congruent given coordinate plane representations.
	MAFS.8.G.1.AP.4c	Compare area and volume of similar figures.
MAFS.8.G.1.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.G.1.AP.5a	Use angle relationships to find the value of a missing angle.

Cluster 2: Understand and apply the Pythagorean theorem.

STANDARD CODE	STANDARD	
MAFS.8.G.2.6	Explain a proof of the Pythagorean theorem and its converse. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.G.2.AP.6a	Measure the lengths of the sides of multiple right triangles to determine a relationship.
MAFS.8.G.2.7	Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.G.2.AP.7a	Find the hypotenuse of a two-dimensional right triangle using the Pythagorean theorem.
MAFS.8.G.2.8	Apply the Pythagorean theorem to find the distance between two points in a coordinate system. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.8.G.2.AP.8a	Apply the Pythagorean Theorem to determine lengths/distances between two points in a coordinate system by forming right triangles.

Cluster 3: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

STANDARD CODE	STANDARD
MAFS.8.G.3.9	Know the formulas for the volumes of cones, cylinders and spheres and use them to solve real-world and mathematical problems.

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.G.3.AP.9a	Using a calculator, apply the formula to find the volume of three-dimensional shapes (i.e., cubes, spheres and cylinders).

Domain: STATISTICS & PROBABILITY

Cluster 1: Investigate patterns of association in bivariate data.

STANDARD CODE	STANDARD	
MAFS.8.SP.1.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and non-linear association. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.SP.1.AP.1a	Graph data using line graphs, histograms or box plots.
	MAFS.8.SP.1.AP.1b	Graph bivariate data using scatter plots and identify possible associations between the variables.
	MAFS.8.SP.1.AP.1c	Using box plots and scatter plots, identify data points that appear to be outliers.
MAFS.8.SP.1.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model fit by judging the closeness of the data points to the line. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.SP.1.AP.2a	Draw the line of best fit on a scatter plot.
	MAFS.8.SP.1.AP.2b	Identify outliers on a scatter plot given the line of best fit.
MAFS.8.SP.1.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.8.SP.1.AP.3a	Interpret the slope and the y-intercept of a line in the context of data plotted from a real-world situation.
MAFS.8.SP.1.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether they have a curfew on school nights and whether they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.8.SP.1.AP.4a	Analyze displays of bivariate data to develop or select appropriate claims about those data.

Domain: NUMBER & QUANTITY: THE REAL NUMBER SYSTEM

Cluster 1: Extend the properties of exponents to rational exponents.

STANDARD CODE	STANDARD	
MAFS.912.N-RN.1.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *Remarks/Examples*: Algebra 1, Unit 2: In implementing the standards in curriculum, these standards should occur before discussing exponential functions with continuous domains. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.N-RN.1.AP.1a	Understand that the denominator of the rational exponent is the root index and the numerator is the exponent of the radicand (e.g., $5^{1/2} = \sqrt{5}$).
	MAFS.912.N-RN.1.AP.1b	Extend the properties of exponents to justify that $(5^{1/2})^2=5$
MAFS.912.N-RN.1.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents. *Remarks/Examples*: Algebra 1, Unit 2: In implementing the standards in curriculum, these standards should occur before discussing exponential functions with continuous domains. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.N-RN.1.AP.2a	Convert from radical representation to using rational exponents and vice versa.

Cluster 2: Use properties of rational and irrational numbers.

STANDARD CODE	STANDARD	
MAFS.912.N-RN.2.3	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a non-zero rational number and an irrational number is irrational. *Remarks/Examples*: Algebra 1, Unit 5: Connect N.RN.3 to physical situations, e.g., finding the perimeter of a square of area. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.N-RN.2.AP.3a	Know and justify that when adding or multiplying two rational numbers the result is a rational number.
	MAFS.912.N-RN.2.AP.3b	Know and justify that when adding a rational number and an irrational number the result is irrational.
	MAFS.912.N-RN.2.AP.3c	Know and justify that when multiplying of a nonzero rational number and an irrational number the result is irrational.

Domain: NUMBER & QUANTITY: QUANTITIES

Cluster 1: Reason quantitatively and use units to solve problems.

STANDARD CODE	STANDARD
MAFS.912.N-Q.1.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *Remarks/Examples*: Algebra 1, Unit 1: Working with quantities and the relationships between them provides grounding for work with expressions, equations and functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.N-Q.1.AP.1a — Interpret units in the context of the problem.
	MAFS.912.N-Q.1.AP.1b — When solving a multi-step problem, use units to evaluate the appropriateness of the solution.
	MAFS.912.N-Q.1.AP.1c — Choose the appropriate units for a specific formula and interpret the meaning of the unit in that context.
	MAFS.912.N-Q.1.AP.1d — Choose and interpret both the scale and the origin in graphs and data displays.
MAFS.912.N-Q.1.2	Define appropriate quantities for the purpose of descriptive modeling. *Remarks/Examples*: Algebra 1, Unit 1: Working with quantities and the relationships between them provides grounding for work with expressions, equations and functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.N-Q.1.AP.2a — Determine and interpret appropriate quantities when using descriptive modeling.
MAFS.912.N-Q.1.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *Remarks/Examples*: Algebra 1, Unit 1: Working with quantities and the relationships between them provides grounding for work with expressions, equations and functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.N-Q.1.AP.3a — Describe the accuracy of measurement when reporting quantities (you can lessen your limitations by measuring precisely).

Domain: ALGEBRA: SEEING STRUCTURE IN EXPRESSIONS

Cluster 1: Interpret the structure of expressions

STANDARD CODE	STANDARD
MAFS.912.A-SSE.1.1	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret as the product of P and a factor not depending on P.*

	Remarks/Examples: Algebra 1, Unit 1: Limit to linear expressions and to exponential expressions with integer exponents. Algebra 1, Unit 4: Focus on quadratic and exponential expressions. For A.SSE.1b, exponents are extended from the integer exponents found in Unit 1 to rational exponents focusing on those that represent square or cube roots. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.A-SSE.1.AP.1a	Identify the different parts of the expression and explain their meaning within the context of a problem.
MAFS.912.A-SSE.1.AP.1b	Decompose expressions and make sense of the multiple factors and terms by explaining the meaning of the individual parts.

MAFS.912.A-SSE.1.2	Use the structure of an expression to identify ways to rewrite it. *For example, see – as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.* *Remarks/Examples*: Algebra 1, Unit 4: Focus on quadratic and exponential expressions. For A.SSE.1b, exponents are extended from the integer exponents found in Unit 1 to rational exponents focusing on those that represent square or cube roots. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.A-SSE.1.AP.2a	Rewrite algebraic expressions in different equivalent forms, such as factoring or combining like terms.
MAFS.912.A-SSE.1.AP.2b	Use factoring techniques such as common factors, grouping, the difference of two squares, the sum or difference of two cubes, or a combination of methods to factor completely.
MAFS.912.A-SSE.1.AP.2c	Simplify expressions including combining like terms, using the distributive property, and other operations with polynomials.

Cluster 2: Write expressions in equivalent forms to solve problems

STANDARD CODE	STANDARD
MAFS.912.A-SSE.2.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression can be rewritten as ≈ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* *Remarks/Examples*: Algebra 1, Unit 4: It is important to balance conceptual understanding and procedural fluency in work with equivalent expressions. For example, development of skill in factoring and completing the square goes hand-in-hand with understanding what different forms of a quadratic expression reveal. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.A-SSE.2.AP.3a	Write expressions in equivalent forms by factoring to find the zeros of a quadratic function and explain the meaning of the zeros.
MAFS.912.A-SSE.2.AP.3b	Given a quadratic function, explain the meaning of the zeros of the function (e.g., if f(x) = (x – c) (x – a) then f(a) = 0 and f(c) = 0).
MAFS.912.A-SSE.2.AP.3c	Given a quadratic expression, explain the meaning of the zeros graphically (e.g., for an expression (x – a) (x – c), a and c correspond to the x-

		intercepts (if a and c are real).
	MAFS.912.A-SSE.2.AP.3d	Write expressions in equivalent forms by completing the square to convey the vertex form, to find the maximum or minimum value of a quadratic function, and to explain the meaning of the vertex.
	MAFS.912.A-SSE.2.AP.3e	Use properties of exponents (such as power of a power, product of powers, power of a product, and rational exponents, etc.) to write an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay.

Domain: ALGEBRA: ARITHMETIC WITH POLYNOMIALS & RATIONAL EXPRESSIONS

Cluster 1: Perform arithmetic operations on polynomials

STANDARD CODE	STANDARD	
MAFS.912.A-APR.1.1	Understand that polynomials form a system analogous to the integers; namely, they are closed under the operations of addition, subtraction and multiplication; add, subtract and multiply polynomials. *Remarks/Examples*: Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.A-APR.1.AP.1a	Understand the definition of a polynomial.
	MAFS.912.A-APR.1.AP.1b	Understand the concepts of combining like terms and closure.
	MAFS.912.A-APR.1.AP.1c	Add, subtract, and multiply polynomials and understand how closure applies under these operations.

Cluster 2: Understand the relationship between zeros and factors of polynomials

STANDARD CODE	STANDARD	
MAFS.912.A-APR.2.2	Know and apply the remainder theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.A-APR.2.AP.2a	Understand and apply the remainder theorem.
	MAFS.912.A-APR.2.AP.2b	Understand that a is a root of a polynomial function if and only if x-a is a factor of the function.
MAFS.912.A-APR.2.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.A-APR.2.AP.3a	Find the zeros of a polynomial when the polynomial is factored (e.g., If given the polynomial equation $y = x^2 + 5x + 6$, factor the polynomial as $y = (x + 3)(x + 2)$. Then find the zeros of y by setting each factor equal to zero and solving. $x = –2$ and $x = –3$ are the two zeroes of y.).
	MAFS.912.A-APR.2.AP.3b	Use the zeros of a function to sketch a graph of the function.

Domain: ALGEBRA: CREATING EQUATIONS

Cluster 1: Create equations that describe numbers or relationships

STANDARD CODE	STANDARD
MAFS.912.A-CED.1.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational, absolute and exponential functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.A-CED.1.AP.1a — Create linear, quadratic, rational, and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems.
MAFS.912.A-CED.1.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *Remarks/Examples*: Algebra 1, Unit 1: Limit A.CED.1 and A.CED.2 to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs. Algebra 1, Unit 4: Extend work on linear and exponential equations in Unit 1 to quadratic equations. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.A-CED.1.AP.2a — Graph equations in two or more variables on coordinate axes with labels and scales.
MAFS.912.A-CED.1.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* *Remarks/Examples*: Algebra 1, Unit 1: Limit A.CED.3 to linear equations and inequalities. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.A-CED.1.AP.3a — Identify and interpret the solution of a system of linear equations from a real-world context that has been graphed.
MAFS.912.A-CED.1.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.* *Remarks/Examples*: Algebra 1, Unit 1: Limit A.CED.4 to formulas that are linear in the variable of interest. Algebra 1, Unit 4: Extend A.CED.4 to formulas involving squared variables. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.912.A-CED.1.AP.4a — Solve multi-variable formulas or literal equations for a specific variable.

Domain: ALGEBRA: REASONING WITH EQUATIONS & INEQUALITIES

Cluster 1: Understand solving equations as a process of reasoning and explain the reasoning.

STANDARD CODE	STANDARD
MAFS.912.A-REI.1.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. *Remarks/Examples*: Algebra 1, Unit 1: Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses. Students will solve exponential equations with logarithms in Algebra II. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.A-REI.1.AP.1a — Solve equations with one or two variables and explain the process.
MAFS.912.A-REI.1.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.A-REI.1.AP.2a — Solve simple rational and radical equations in one variable.

Cluster 2: Solve equations and inequalities in one variable.

STANDARD CODE	STANDARD
MAFS.912.A-REI.2.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. *Remarks/Examples*: Algebra 1, Unit 1: Extend earlier work with solving linear equations to solving linear inequalities in one variable and to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as $5^x=125$ or $2^x=1/16$ *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.A-REI.2.AP.3a — Solve linear equations in one variable, including coefficients represented by letters.
	MAFS.912.A-REI.2.AP.3b — Solve linear inequalities in one variable, including coefficients represented by letters.
MAFS.912.A-REI.2.4	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. *Remarks/Examples*: Algebra 1, Unit 4: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS

	MAFS.912.A-REI.2.AP.4a	Solve quadratic equations by completing the square.
	MAFS.912.A-REI.2.AP.4b	Solve quadratic equations by using the quadratic formula.
	MAFS.912.A-REI.2.AP.4c	Solve quadratic equations by factoring.

Cluster 3: Solve systems of equations.

STANDARD CODE	STANDARD	
MAFS.912.A-REI.3.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. *Remarks/Examples*: Algebra 1, Unit 2: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to GPE.5 when it is taught in geometry, which requires students to prove the slope criteria for parallel lines. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.A-REI.3.AP.5a	Create a multiple of a linear equation showing that they are equivalent (e.g., x + y = 6 is equivalent to 2x + 2y = 12).
	MAFS.912.A-REI.3.AP.5b	Find the sum of two equations.
MAFS.912.A-REI.3.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. *Remarks/Examples*: Algebra 1, Unit 2: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to GPE.5 when it is taught in geometry, which requires students to prove the slope criteria for parallel lines. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.A-REI.3.AP.6a	Given a graph, describe or select the solution to a system of linear equations.
	MAFS.912.A-REI.3.AP.6b	Solve systems of nonlinear equations using substitution.

Cluster 4: Represent and solve equations and inequalities graphically.

STANDARD CODE	STANDARD	
MAFS.912.A-REI.4.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). *Remarks/Examples*: Algebra 1, Unit 2: For A.REI.10, focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.A-REI.4.AP.10a	Identify and graph the solutions (ordered pairs) on a graph of an equation in two variables.
MAFS.912.A-REI.4.11	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential and logarithmic functions.	

	Remarks/Examples: Algebra 1, Unit 2: For A.REI.11, focus on cases where f(x) and g(x) are linear or exponential. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS MAFS.912.A-REI.4.AP.11a — Understand the solution to a system of two linear equations in two variables corresponds to a point(s) of an intersection of their graphs, because the point(s) of intersection satisfies both equations simultaneously.
MAFS.912.A-REI.4.12	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS MAFS.912.A-REI.4.AP.12a — Graph a linear inequality in two variables using at least two coordinate pairs that are solutions. MAFS.912.A-REI.4.AP.12b — Graph a system of linear inequalities in two variables using at least two coordinate pairs for each inequality.

Domain: FUNCTIONS: INTERPRETING FUNCTIONS

Cluster 1: Understand the concept of a function and use function notation.

STANDARD CODE	STANDARD
MAFS.912.F-IF.1.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). *Remarks/Examples*: Algebra 1, Unit 2: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS MAFS.912.F-IF.1.AP.1a — Demonstrate that to be a function, from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. MAFS.912.F-IF.1.AP.1b — Map elements of the domain sets to the corresponding range sets of functions and determine the rules in the relationship.
MAFS.912.F-IF.1.2	Use function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context. *Remarks/Examples*: Algebra 1, Unit 2: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS MAFS.912.F-IF.1.AP.2a — Match the correct function notation to a function or a model of a function (e.g., x f(x) y).
MAFS.912.F-IF.1.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1. *Remarks/Examples*: Algebra 1, Unit 2: In F.IF.3, draw connection to F.BF.2, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences

	as examples of linear and exponential functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.F-IF.1.AP.3a	Recognize that the domain of a sequence is a subset of the integers. .

Cluster 2: Interpret functions that arise in applications in terms of the context.

STANDARD CODE	STANDARD	
MAFS.912.F-IF.2.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* *Remarks/Examples*: Algebra 1, Unit 2: For F.IF.4 and 5, focus on linear and exponential functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.F-IF.2.AP.4a	Recognize and interpret the key features of a function.
	MAFS.912.F-IF.2.AP.4b	Select the graph that matches the description of the relationship between two quantities in the function.
MAFS.912.F-IF.2.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* *Remarks/Examples*: Algebra 1, Unit 2: For F.IF.4 and 5, focus on linear and exponential functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.F-IF.2.AP.5a	Given the graph of a function, determine the domain.
MAFS.912.F-IF.2.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *Remarks/Examples*: Algebra 1, Unit 2: For F.IF.6, focus on linear functions and exponential functions whose domain is a subset of the integers. Unit 5 in this course and the Algebra II course address other types of functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.F-IF.2.AP.6a	Describe the rate of change of a function using words.
	MAFS.912.F-IF.2.AP.6b	Describe the rate of change of a function using numbers.
	MAFS.912.F-IF.2.AP.6c	Pair the rate of change with its graph.

Cluster 3: Analyze functions using different representations.

STANDARD CODE	STANDARD
MAFS.912.F-IF.3.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima and minima. b. Graph square root, cube root and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
ACCESS POINTS	
MAFS.912.F-IF.3.AP.7a	Select a graph of a function that displays its symbolic representation (e.g., f(x) = 3x + 5).
MAFS.912.F-IF.3.AP.7b	Locate the key features of linear and quadratic equations.
MAFS.912.F-IF.3.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percentage rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.* *Remarks/Examples*: Algebra 1, Unit 5: Note that this unit, and in particular in F.IF.8b, extends the work begun in Unit 2 on exponential functions with integer exponents. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
ACCESS POINTS	
MAFS.912.F-IF.3.AP.8a	Write or select an equivalent form of a function [e.g., y = mx + b, f(x) = y, $y - y_1 = m(x - x_1)$, Ax + By = C].
MAFS.912.F-IF.3.AP.8b	Describe the properties of a function (e.g., rate of change, maximum, minimum, etc.).
MAFS.912.F-IF.3.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* *Remarks/Examples*: Algebra 1, Unit 2: For F.IF.7a, 7e and 9 focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as $y=3^n$ and $y=100^2$ Algebra 1, Unit 5: For F.IF.9, focus on expanding the types of functions considered to include, linear, exponential and quadratic. Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
ACCESS POINTS	
MAFS.912.F-IF.3.AP.9a	Compare the properties of two functions.

Domain: FUNCTIONS: BUILDING FUNCTIONS

Cluster 1: Build a function that models a relationship between two quantities

STANDARD CODE	STANDARD
MAFS.912.F-BF.1.1	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* c. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* *Remarks/Examples*: Algebra 1, Unit 2: Limit to F.BF.1a, 1b and 2 to linear and exponential functions. Algebra 1, Unit 5: Focus on situations that exhibit a quadratic relationship. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning

ACCESS POINTS	
MAFS.912.F-BF.1.AP.1a	Select a function that describes a relationship between two quantities (e.g., relationship between inches and centimeters, Celsius Fahrenheit, distance = rate x time, recipe for peanut butter and jelly- relationship of peanut butter to jelly f(x)=2x, where x is the quantity of jelly, and f(x) is peanut butter.

Cluster 2: Build new functions from existing functions

STANDARD CODE	STANDARD
MAFS.912.F-BF.2.3	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* *Remarks/Examples*: Algebra 1, Unit 2: Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard. Algebra 1, Unit 5: For F.BF.3, focus on quadratic functions, and consider including absolute value functions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.F-BF.2.AP.3a	Write or select the graph that represents a defined change in the function (e.g., recognize the effect of changing *k* on the corresponding graph).

Domain: FUNCTIONS: LINEAR, QUADRATIC & EXPONENTIAL MODELS	
Cluster 1: Construct and compare linear, quadratic and exponential models and solve problems.	
STANDARD CODE	**STANDARD**
MAFS.912.F-LE.1.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percentage rate per unit interval relative to another. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.F-LE.1.AP.1a — Select the appropriate graphical representation of a linear model based on real-world events.
	MAFS.912.F-LE.1.AP.1b — In a linear situation using graphs or numbers, predict the change in rate based on a given change in one variable (e.g., If I have been adding sugar at a rate of 1T per cup of water, what happens to my rate if I switch to 2T of sugar for every cup of water?).
MAFS.912.F-LE.1.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship or two input-output pairs (include reading these from a table). *Remarks/Examples*: Algebra 1, Unit 2: In constructing linear functions in F.LE.2, draw on and consolidate previous work in grade 8 on finding equations for lines and linear functions (8.EE.6, 8.F.4). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.F-LE.1.AP.2a — Select the graph, the description of a relationship or two input-output pairs of linear functions.
MAFS.912.F-LE.1.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically or (more generally) as a polynomial function. *Remarks/Examples*: Algebra 1, Unit 2: For F.LE.3, limit to comparisons between linear and exponential models. Algebra 1, Unit 5: Compare linear and exponential growth to quadratic growth. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.F-LE.1.AP.3a — Compare graphs of linear, exponential, and quadratic growth graphed on the same coordinate plane.
MAFS.912.F-LE.1.4	For exponential models, express as a logarithm the solution to = d where a, c and d are numbers and the base b is 2, 10 or e; evaluate the logarithm using technology. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

Cluster 2: Interpret expressions for functions in terms of the situation they model.

STANDARD CODE	STANDARD
MAFS.912.F-LE.2.5	Interpret the parameters in a linear or exponential function in terms of a context. *Remarks/Examples*: Algebra 1, Unit 2: Limit exponential functions to those of the form $f(x) = b^x + k$. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.F-LE.2.AP.5a — Describe the meaning of the factors and intercepts on linear and exponential functions.

Domain: GEOMETRY: CONGRUENCE

Cluster 1: Experiment with transformations in the plane

STANDARD CODE	STANDARD
MAFS.912.G-CO.1.1	Know precise definitions of angle, circle, perpendicular line, parallel line and line segment, based on the undefined notions of point, line, distance along a line and distance around a circular arc. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.912.G-CO.1.AP.1a — Identify precise definitions of angle, circle, perpendicular line, parallel line and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MAFS.912.G-CO.1.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-CO.1.AP.2a — Represent transformations in the plane using, e.g., transparencies and geometry software.
	MAFS.912.G-CO.1.AP.2b — Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
MAFS.912.G-CO.1.3	Given a rectangle, parallelogram, trapezoid or regular polygon, describe the rotations and reflections that carry it onto itself. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-CO.1.AP.3a — Describe the rotations and reflections of a rectangle, parallelogram, trapezoid, or regular polygon that maps each figure onto itself.
MAFS.912.G-CO.1.4	Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning

	ACCESS POINTS	
	MAFS.912.G-CO.1.AP.4a	Using previous comparisons and descriptions of transformations, develop and understand the meaning of rotations, reflections, and translations based on angles, circles, perpendicular lines, parallel lines, and line segments.
MAFS.912.G-CO.1.5	Given a geometric figure and a rotation, reflection or translation, draw the transformed figure using, e.g., graph paper, tracing paper or geometry software. Specify a sequence of transformations that will carry a given figure onto another. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-CO.1.AP.5a	Transform a geometric figure given a rotation, reflection, or translation using graph paper, tracing paper, or geometric software.
	MAFS.912.G-CO.1.AP.5b	Create sequences of transformations that map a geometric figure on to itself and another geometric figure.

Cluster 2: Understand congruence in terms of rigid motions.

STANDARD CODE	STANDARD	
MAFS.912.G-CO.2.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-CO.2.AP.6a	Use descriptions of rigid motion and transformed geometric figures to predict the effects rigid motion has on figures in the coordinate plane.
	MAFS.912.G-CO.2.AP.6b	Knowing that rigid transformations preserve size and shape or distance and angle, use this fact to connect the idea of congruency and develop the definition of congruent.
MAFS.912.G-CO.2.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. *Cognitive Complexity:* Level 1: Recall	
	ACCESS POINTS	
	MAFS.912.G-CO.2.AP.7a	Use definitions to demonstrate congruency and similarity in figures.
MAFS.912.G-CO.2.8	Explain how the criteria for triangle congruence angle-side-angle (ASA), side-angle-side (SAS), side-side-side (SSS) and hypotenuse-leg follow from the definition of congruence in terms of rigid motions. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-CO.2.AP.8a	Use the definition of congruence, based on rigid motion, to develop and explain the triangle congruence criteria; ASA, SSS, and SAS.

Cluster 3: Prove geometric theorems.

STANDARD CODE	STANDARD
MAFS.912.G-CO.3.9	Prove theorems about lines and angles; use theorems about lines and angles to solve problems. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

	Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.G-CO.3.AP.9a	Measure lengths of line segments and angles to establish the facts about the angles created when parallel lines are cut by a transversal and the points on a perpendicular bisector.
MAFS.912.G-CO.3.10	Prove theorems about triangles; use theorems about triangles to solve problems. Theorems include: measures of interior identify angles of a triangle sum to 180°; triangle inequality theorem; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.G-CO.3.AP.10a	Measure the angles and sides of equilateral, isosceles, and scalene triangles to establish facts about triangles.
MAFS.912.G-CO.3.11	Prove theorems about parallelograms; use theorems about parallelograms to solve problems. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.G-CO.3.AP.11a	Measure the angles and sides of parallelograms to establish facts about parallelograms.

Cluster 4: Make geometric constructions.

STANDARD CODE	STANDARD	
MAFS.912.G-CO.4.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-CO.4.AP.12a	Copy a segment.
	MAFS.912.G-CO.4.AP.12b	Copy an angle.
	MAFS.912.G-CO.4.AP.12c	Bisect a segment.
	MAFS.912.G-CO.4.AP.12d	Bisect an angle.
	MAFS.912.G-CO.4.AP.12e	Construct perpendicular lines, including the perpendicular bisector of a line segment.
	MAFS.912.G-CO.4.AP.12f	Construct a line parallel to a given line through a point not on the line.
MAFS.912.G-CO.4.13	Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-CO.4.AP.13a	Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle..

Domain: GEOMETRY: SIMILARITY, RIGHT TRIANGLES & TRIGONOMETRY

Cluster 1: Understand similarity in terms of similarity transformations.

STANDARD CODE	STANDARD	
MAFS.912.G-SRT.1.1	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.1.AP.1a	Given a center and a scale factor, verify experimentally that when dilating a figure in a coordinate plane, a segment of the pre-image that does not pass through the center of the dilation, is parallel to its image when the dilation is performed. However, a segment that passes through the center remains unchanged.
	MAFS.912.G-SRT.1.AP.1b	Given a center and a scale factor, verify experimentally that when performing dilations of a line segment, the pre-image, the segment which becomes the image is longer or shorter based on the ratio given by the scale factor.
MAFS.912.G-SRT.1.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.1.AP.2a	Determine if two figures are similar.
	MAFS.912.G-SRT.1.AP.2b	Given two figures, determine whether they are similar and explain their similarity based on the equality of corresponding angles and the proportionality of corresponding sides.
MAFS.912.G-SRT.1.3	Use the properties of similarity transformations to establish the angle-angle (AA) criterion for two triangles to be similar. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.1.AP.3a	Apply the angle-angle (AA) criteria for triangle similarity on two triangles.

Cluster 2: Prove theorems involving similarity.

STANDARD CODE	STANDARD	
MAFS.912.G-SRT.2.4	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean theorem proved using triangle similarity.* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.G-SRT.2.AP.4a	Establish facts about the lengths of segments of sides of a triangle when a line parallel to one side of the triangles divides the other two sides proportionally.
MAFS.912.G-SRT.2.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	
	MAFS.912.G-SRT.2.AP.5a	Apply the criteria for triangle congruence and/or similarity (angle-side-angle [ASA], side-angle-side [SAS], side-side-side [SSS], angle-angle [AA] to determine if geometric shapes that divide into triangles are or are not congruent and/or can be similar.

Cluster 3: Define trigonometric ratios and solve problems involving right triangles.

STANDARD CODE	STANDARD	
MAFS.912.G-SRT.3.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.3.AP.6a	Using a corresponding angle of similar right triangles, show that the relationships of the side ratios are the same, which leads to the definition of trigonometric ratios for acute angles.
MAFS.912.G-SRT.3.7	Explain and use the relationship between the sine and cosine of complementary angles. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.3.AP.7a	Explore the sine of an acute angle and the cosine of its complement and determine their relationship.
MAFS.912.G-SRT.3.8	Use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-SRT.3.AP.8a	Apply both trigonometric ratios and Pythagorean Theorem to solve application problems involving right triangles.

Domain: GEOMETRY: CIRCLES

Cluster 1: Understand and apply theorems about circles.

STANDARD CODE	STANDARD	
MAFS.912.G-C.1.1	Prove that all circles are similar. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-C.1.AP.1a	Compare the ratio of diameter to circumference for several circles to establish all circles are similar.
MAFS.912.G-C.1.2	Identify and describe relationships among inscribed angles, radii and chords. *Include the relationship between central, inscribed and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts	
	ACCESS POINTS	
	MAFS.912.G-C.1.AP.2a	Identify and describe relationships among inscribed angles, radii and chords.
MAFS.912.G-C.1.3	Construct the inscribed and circumscribed circles of a triangle and prove properties of angles for a quadrilateral inscribed in a circle. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning	
	ACCESS POINTS	

	MAFS.912.G-C.1.AP.3a	Construct the inscribed and circumscribed circles of a triangle.

Cluster 2: Find arc lengths and areas of sectors of circles.

STANDARD CODE	STANDARD
MAFS.912.G-C.2.5	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning

ACCESS POINTS	
MAFS.912.G-C.2.AP.5a	Find the arc length of a circle.
MAFS.912.G-C.2.AP.5b	Derive the fact that the length of the arc intercepted by an angle is proportional to the radius.
MAFS.912.G-C.2.AP.5c	Apply the formula to the area of a sector (e.g., area of a slice of pie).

Domain: GEOMETRY: EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS

Cluster 1: Translate between the geometric description and the equation for a conic section.

STANDARD CODE	STANDARD
MAFS.912.G-GPE.1.1	Derive the equation of a circle of given center and radius using the Pythagorean theorem; complete the square to find the center and radius of a circle given by an equation. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.G-GPE.1.AP.1a	Given the center and the radius of a circle, use the Pythagorean theorem to find the equation of the circle.
MAFS.912.G-GPE.1.AP.1b	Given the equation, find the center and the radius of a circle.

Cluster 2: Use coordinates to prove simple geometric theorems algebraically.

STANDARD CODE	STANDARD
MAFS.912.G-GPE.2.4	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).* *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.G-GPE.2.AP.4a	Use coordinates to prove simple geometric theorems algebraically.

MAFS.912.G-GPE.2.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-GPE.2.AP.5a: Using slope, prove lines are parallel or perpendicular.
	MAFS.912.G-GPE.2.AP.5b: Find equations of lines based on certain slope criteria such as; finding the equation of a line parallel or perpendicular to a given line that passes through a given point.
MAFS.912.G-GPE.2.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.912.G-GPE.2.AP.6a: Given two points, find the point on the line segment between the two points that divides the segment into a given ratio.
MAFS.912.G-GPE.2.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.912.G-GPE.2.AP.7a: Use the distance formula to calculate perimeter and area of polygons plotted on a coordinate plane.

Domain: GEOMETRY: GEOMETRIC MEASUREMENT & DIMENSION

Cluster 1: Explain volume formulas and use them to solve problems.

STANDARD CODE	STANDARD
MAFS.912.G-GMD.1.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid and cone. *Use dissection arguments, Cavalieri's principle and informal limit arguments.* *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.G-GMD.1.AP.1a: Describe why the formulas work for a circle or cylinder (circumference of a circle, area of a circle, volume of a cylinder) based on a dissection.
MAFS.912.G-GMD.1.3	Use volume formulas for cylinders, pyramids, cones and spheres to solve problems. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-GMD.1.AP.3a: Use appropriate formulas to calculate volume for cylinders, pyramids, and cones.

Cluster 2: Visualize relationships between two-dimensional and three-dimensional objects.

STANDARD CODE	STANDARD
MAFS.912.G-GMD.2.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-GMD.2.AP.4a: Identify shapes created by cross sections of two-dimensional and three-dimensional figures.

Domain: GEOMETRY: MODELING WITH GEOMETRY	
Cluster 1: Apply geometric concepts in modeling situations.	
STANDARD CODE	**STANDARD**
MAFS.912.G-MG.1.1	Use geometric shapes, their measures and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). *Cognitive Complexity:* Level 1: Recall
	ACCESS POINTS
	MAFS.912.G-MG.1.AP.1a — Describe the relationship between the attributes of a figure and the changes in the area or volume when one attribute is changed.
MAFS.912.G-MG.1.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.G-MG.1.AP.2a — Recognize the relationship between density and area; density and volume using real-world models.
MAFS.912.G-MG.1.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). *Cognitive Complexity:* Level 3: Strategic Thinking & Complex Reasoning
	ACCESS POINTS
	MAFS.912.G-MG.1.AP.3a — Apply the formula of geometric figures to solve design problems (e.g., designing an object or structure to satisfy physical restraints or minimize cost).

Domain: STATISTICS & PROBABILITY: INTERPRETING CATEGORICAL & QUANTITATIVE DATA	
Cluster 1: Summarize, represent and interpret data on a single count or measurement variable.	
STANDARD CODE	**STANDARD**
MAFS.912.S-ID.1.1	Represent data with plots on the real number line (dot plots, histograms and box plots). *Remarks/Examples*: In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.S-ID.1.AP.1a — Complete a graph given the data, using dot plots, histograms or box plots.
MAFS.912.S-ID.1.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. *Remarks/Examples*:

	In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.S-ID.1.AP.2a	Describe a distribution using center and spread
MAFS.912.S-ID.1.AP.2b	Use the correct measure of center and spread to describe a distribution that is symmetric or skewed.
MAFS.912.S-ID.1.AP.2c	Identify outliers (extreme data points) and their effects on data sets.
MAFS.912.S-ID.1.AP.2d	Compare two or more different data sets using the center and spread of each.

MAFS.912.S-ID.1.3	Interpret differences in shape, center and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). *Remarks/Examples*: In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.S-ID.1.AP.3a	Use statistical vocabulary to describe the difference in shape, spread, outliers and the center (mean).

MAFS.912.S-ID.1.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.S-ID.1.AP.4a	Use descriptive stats like range, median, mode, mean and outliers/gaps to describe the data set.

Cluster 2: Summarize, represent and interpret data on two categorical and quantitative variables.

STANDARD CODE	STANDARD
MAFS.912.S-ID.2.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts

ACCESS POINTS	
MAFS.912.S-ID.2.AP.5a	Recognize associations and trends in data from a two-way table.

MAFS.912.S-ID.2.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. *Remarks/Examples*: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals. S.ID.6b should be focused on linear models, but may be used to preview quadratic functions in Unit 5 of this course.

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.S-ID.2.AP.6a — Create a scatter plot from two quantitative variables.
	MAFS.912.S-ID.2.AP.6b — Describe the form, strength, and direction of the relationship.
	MAFS.912.S-ID.2.AP.6c — Categorize data as linear or not.
	MAFS.912.S-ID.2.AP.6d — Use algebraic methods and technology to fit a linear function to the data.
	MAFS.912.S-ID.2.AP.6e — Use the function to predict values.
	MAFS.912.S-ID.2.AP.6f — Explain the meaning of the constant and coefficients in context.

Cluster 3: Interpret linear models

STANDARD CODE	STANDARD
MAFS.912.S-ID.3.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. *Remarks/Examples*: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.S-ID.3.AP.7a — Interpret the meaning of the slope and y-intercept in context.
MAFS.912.S-ID.3.8	Compute (using technology) and interpret the correlation coefficient of a linear fit. *Remarks/Examples*: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.S-ID.3.AP.8a — Identify the correlation coefficient (r) of a linear fit.
	MAFS.912.S-ID.3.AP.8b — Describe the correlation coefficient (r) of a linear fit (e.g., a strong or weak positive, negative, perfect correlation).
MAFS.912.S-ID.3.9	Distinguish between correlation and causation. *Remarks/Examples*: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9. *Cognitive Complexity:* Level 2: Basic Application of Skills & Concepts
	ACCESS POINTS
	MAFS.912.S-ID.3.AP.9a — Given a correlation in a real-world scenario, determine if there is causation.