



National Center and State Collaborative

Core Content Connectors: Measurement 2

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National Center and State Collaborative

The National Center and State Collaborative (NCSC) is applying the lessons learned from the past decade of research on alternate assessments based on alternate achievement standards (AA-AAS) to develop a multi-state comprehensive assessment system for students with significant cognitive disabilities. The project draws on a strong research base to develop an AA-AAS that is built from the ground up on powerful validity arguments linked to clear learning outcomes and defensible assessment results, to complement the work of the Race to the Top Common State Assessment Program (RTTA) consortia.

Our long-term goal is to ensure that students with significant cognitive disabilities achieve increasingly higher academic outcomes and leave high school ready for post-secondary options. A well-designed summative assessment alone is insufficient to achieve that goal. Thus, NCSC is developing a full system intended to support educators, which includes formative assessment tools and strategies, professional development on appropriate interim uses of data for progress monitoring, and management systems to ease the burdens of administration and documentation. All partners share a commitment to the research-to-practice focus of the project and the development of a comprehensive model of curriculum, instruction, assessment, and supportive professional development. These supports will improve the alignment of the entire system and strengthen the validity of inferences of the system of assessments.



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This document is available in alternative formats upon request.

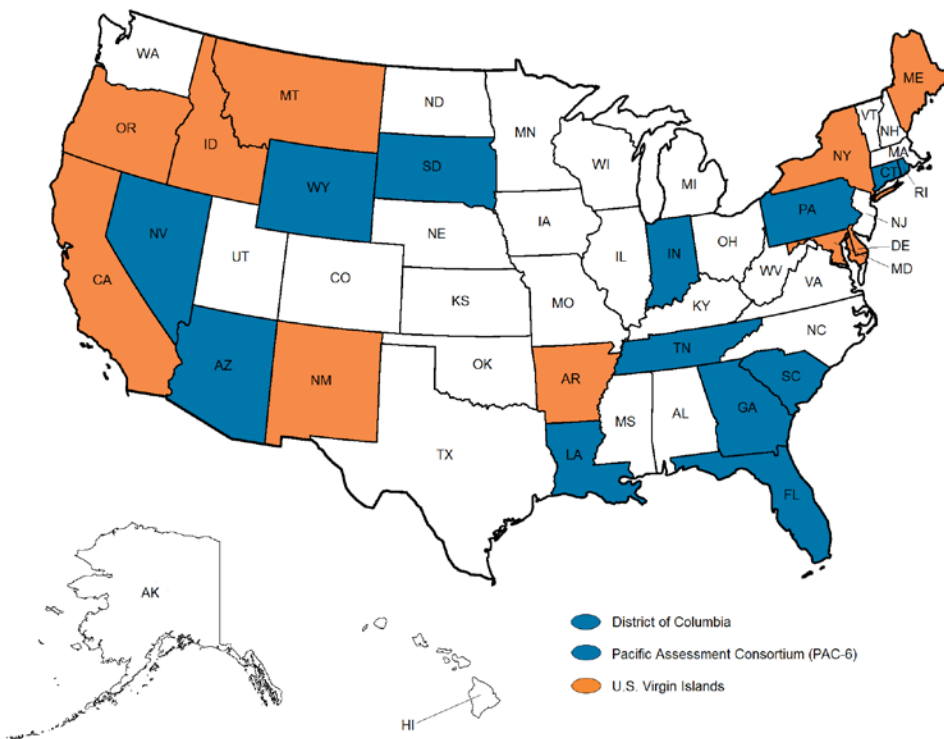


National Center and State Collaborative

NCSC is a collaborative of 15 states and five organizations.

The states include (shown in blue on map): Arizona, Connecticut, District of Columbia, Florida, Georgia, Indiana, Louisiana, Nevada, Pacific Assessment Consortium (PAC-6)¹, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, and Wyoming.

Tier II states are partners in curriculum, instruction, and professional development implementation but are not part of the assessment development work. They are (shown in orange on map): Arkansas, California, Delaware, Idaho, Maine, Maryland, Montana, New Mexico, New York, Oregon, and U.S. Virgin Islands.



*Core partner states are blue in color and Tier II states are orange in color.

¹ The Pacific Assessment Consortium (including the entities of American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and Republic of the Marshall Islands) partner with NCSC as one state, led by the University of Guam Center for Excellence in Developmental Disabilities Education, Research, and Service (CEDDERS).



National Center and State Collaborative

The five partner organizations include: The National Center on Educational Outcomes (NCEO) at the University of Minnesota, The National Center for the Improvement of Educational Assessment (Center for Assessment), The University of North Carolina at Charlotte, The University of Kentucky, and edCount, LLC.



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Identifying the Core Content of the Learning Progressions Framework for the Common Core State Standards for Students Who Participate in AA-AAS

Introduction

The purpose of this paper is to describe the development and prioritization of the academic content for students with significant cognitive disabilities. This prioritized academic content is referred to as Core Content Connectors (CCCs). This work is part of the NCSC GSEG and provides the foundation for the development of curriculum resources, professional development, instructional resources, and alternate assessment based on alternate achievement standards (AA-AAS). A unique feature of the development and prioritization of academic content is the use of learning progressions framework (LPF), which is built to include relationships with the Common Core State Standards (CCSSs). The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression and is a starting point for thinking about how students develop competency in an academic domain (Hess, 2010). The following sections describe the use of LPFs for identifying specific grade-level Common Core State Standards (CCSS), and the development of the CCCs for providing more specificity for teachers.

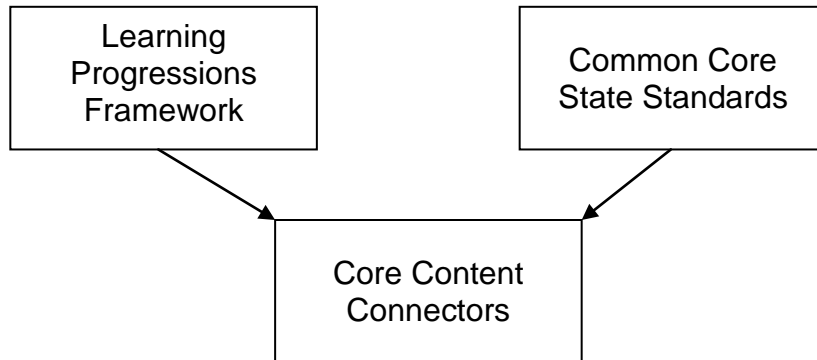
Learning Progression Framework

The National Alternate Assessment Center, under the leadership of Karin Hess, developed LPFs. Hess's (2008) definition of LPs is based on four interrelated guiding principles: (a) LPs are developed and refined using available research and evidence, (b) LPs have clear binding threads that articulate the essential core concepts and processes of a discipline sometimes referred to as the "big ideas" of the discipline, (c) LPs articulate movement towards increased understanding, and (d) LPs go hand-in-hand with well-designed and aligned assessments.

The grade span learning targets of the LPF were identified by national content experts and are a broad description of the essential content and general sequencing for student learning and skill development. The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression. The LPF is currently available at http://www.nciea.org/publications/Math_LPF_KH11.pdf

Core Content Connectors

The Core Content Connectors (CCCs) are the prioritized academic content designed to frame the instruction and assessment of students with significant cognitive disabilities. The CCCs create a connection between the Learning Progressions Framework (LPF) and Common Core State Standards (CCSS) for these students.



The purpose of the CCCs is to identify the most salient core academic content in ELA and math found in both the CCSS and the LPF Progress Indicators (LPF PIs) (i.e., observable learning along the learning continuum for each strand in the LPFs). The CCCs illustrate the necessary knowledge and skills students with significant cognitive disabilities need to reach the learning targets or critical big ideas within the Learning Progression Frameworks (LPF, Hess et al., 2010) and the Common Core State Standard. This identified core content serves as a connection or stage between the LPF (designed for typically developing students) and the CCSS (which define grade level content and achievement). The CCCs are intentionally dually aligned with both the LPFs and the CCSSs. The CCCs identify priorities for the instruction for students in this population, and the alternate assessment. CCCs are designed to contribute to a fully aligned system of content, instruction, and assessment.

Progress Indicator: M.NO.1e describing, representing, and comparing absolute value relationships		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.NO.1e1 Determine the meaning of absolute value	Expressions and Equations 6 NS Apply and extend previous understandings of numbers to the system of rational numbers.	6.NS.7c Understand ordering and absolute value of rational numbers. a) 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.
Progress Indicator: M.NO.1f recognizing equivalence of representations using fractions, decimals, and percents and using them solve ratio problems		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.NO.1f1 Find a percent of a quantity as rate per 100	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3c 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. c) Find a percent 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 percent.
6.NO.1f2 Write or select a ratio to match a given statement and representation	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.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."
6.NO.1f3 Select or make a statement to interpret a given ratio	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.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."

The CCCs preserve the sequence of learning outlined in the LPFs to the extent possible while disaggregating the progress indicators (which describe concepts and skills along the learning continuum for each grade span in the learning progression) into teachable and assessable segments of content. The connectors and corresponding curriculum resource guides were written to help promote how students can engage in the CCSS while following the learning progression.

The CCCs have the following characteristics:

- Sequenced according to the LPFs to help guide meaningful instruction for students and lead to enduring skills in successive grades
- Written as outcome based, which provides a description of what students should know and do
- Written at high levels of expectations for students to eliminate potential ceiling effect for student learning
- Aligned to the grade-level CCSSs to provide access to the general curriculum
- Organized by the six major LPF strands (Symbolic Expression; Nature of Numbers & Operations; Measurement; Patterns, Relations, & Functions; Geometry; and Data Analysis, Probability, & Statistics)

In some grades, CCCs were developed that were considered important for student learning but were not aligned to the LPF. CCCs for some prerequisite skills were included in some of the grades, but these CCCs are for instructional purposes and not intended as a target for assessment. At the high school level, where only one AA-AAS will be administered to students but many CCSSs and LPFs are provided, some subsets of LPF Progress Indicators were selected for developing CCCs.

All CCCs will be provided by the curriculum and instruction work group in NCSC. While states may add additional content standards as they deem necessary that is specific to the needs, states and teachers will NOT have to develop any further CCCs. The complete set will be disseminated upon completion and validation. It is anticipated that states who have adopted the Common Core State Standards can use the CCCs as the priorities for students who take AA-AAS and will not need to create other forms of translations or create extensions of the Common Core unless they choose to do so. Teachers will be able to use these, along with the various curriculum resources, to plan instruction.

Uses of the document

There are several potential uses for this document. The first is to demonstrate how the identified core content builds critical big ideas across the grades. The format is intended to show how students can grow within the linked content across the grades and the connections between the related content to help guide sequential and meaningful instructional efforts. The second potential use is to provide clarity and specificity of the content within each grade level. In the process of identifying the CCC within each of the PI, it was evident that some considerations were necessary related to the content. First, it is necessary to disaggregate the content within some of the PI to a finer grain size. As students with significant cognitive disabilities may require instruction on single concepts, PIs that include multiple concepts may need to be separated in the unpacked content. Additionally, identifying core content requires focusing on the critical big ideas within the content and the need for considering meaningful instructional context within the instruction of students who participate in the alternate assessment. The third use for this document is to demonstrate how the CCCs have direct links to the CCSS. The CCSS that are identified as having the closest match are listed beside the corresponding CCC. As these direct links indicate, the CCC are not weakly linked or “watered down” translations, but instead pinpoint the most salient content in the standard. The potential users of this document ranges from assessment designers to teachers. While the document is not intended to be a standalone instructional resource, it is intended to support teachers in their understanding of the content.

References

- Hess, K. (2010, December). *Learning progressions frameworks designed for use with the Common Core State Standards in mathematics K-12*. National Alternate Assessment Center at the University of Kentucky and the National Center for the Improvement of Educational Assessment, Dover, N.H.
- Hess, K. (2008). Developing and using learning progressions as a schema for measuring progress [online]. Retrieved from http://www.nciea.org/publications/CCSSO2_KH08.pdf

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<i>E.ME-2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements.</i>		<i>M.ME-2 Apply appropriate techniques, strategies, and formulas to solve problems involving measurements (including derived measurements and rates).</i>		<i>H.ME-2 Apply and analyze techniques at an appropriate level of precision and use formulas to quantify or interpret abstract events, objects, and situations.</i>
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
Measurement: Techniques and Tools	1.ME.2a1 Measure using copies of one object to measure another	3.ME.2e1 Select appropriate tool for measurement: liquid volume, area, time, money	6.ME.2b3 Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles, squares, triangles) to measure area	7.ME.2c1 Solve one step real world measurement problems involving area, volume, or surface area of two- and three-dimensional objects	H.ME.2a 1 Describe the accuracy of measurement when reporting quantity (you can lessen your limitations by measuring precisely)
	1.ME.2a2 Use time to sequence up to 3 events, using a digital or analog clock	3.ME.2e2 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch	6.ME.2b4 Decompose complex 3-D shapes into simple 3-D shapes to measure volume		
	2.ME.2a3 Estimate the length of an object using units of feet and inches	3.ME.2e3 Measure to solve problems using number lines and ruler to 1 inch, $\frac{1}{2}$ inch, or $\frac{1}{4}$ of an inch			
	1.ME.2b1 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object end to end	4.ME.2e4 Select appropriate tool for measurement: mass, length, angles			

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<i>E.ME-2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements.</i>		<i>M.ME-2 Apply appropriate techniques, strategies, and formulas to solve problems involving measurements (including derived measurements and rates).</i>		<i>H.ME-2 Apply and analyze techniques at an appropriate level of precision and use formulas to quantify or interpret abstract events, objects, and situations.</i>
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
	2.ME.2b2 Select appropriate tool and demonstrate or identify appropriate measuring techniques	4.ME.2e5 Construct a given angle			
	2.ME.2c1 Determine whether a situation calls for a precise measurement or an estimation	4.ME.2e6 Measure right angles using a tool (e.g., angle ruler, protractor)			
		4.ME.2g Determine whether a situation calls for a precise measurement or an estimation (distance, volume, mass, time, money)			
		3.ME.2i1 Estimate liquid volume			
	2.ME.2a4 Solve one step subtraction problems involving the difference of the lengths of 2 objects in standard length units	3.ME.2h1 Use addition to find the perimeter of a rectangle	5.ME.2a1 Solve problems involving conversions of standard measurement units when finding area, volume, time lapse, or mass		

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<i>E.ME-2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements.</i>		<i>M.ME-2 Apply appropriate techniques, strategies, and formulas to solve problems involving measurements (including derived measurements and rates).</i>		<i>H.ME-2 Apply and analyze techniques at an appropriate level of precision and use formulas to quantify or interpret abstract events, objects, and situations.</i>
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
		4.ME.2f1 Complete a conversion table for length and mass within a single system			
Measurement: Solving Problems		4.ME.2h1 Apply the area and perimeter formula to solve real world problems	5.ME.2b1 Use filling and multiplication to determine volume	7.ME.2d1 Apply formula to measure area and circumference of circles	H.ME.2b1 Determine the dimensions of a figure after dilation
			5.ME.2b2 Apply formula to solve one step problems involving volume	8.ME.2d2 Apply the formula to find the volume of 3 dimensional shapes using a calculator (i.e., cubes, spheres, and cylinders)	H.ME.2b2 Determine if 2 figures are similar
			6.ME.2a2 Solve one step real world measurement problems involving unit rates with ratios of whole numbers when given the unit rate (3 inches of snow falls per hour, how much in 6 hours)		H.ME.2b3 Describe or select why two figures are or are not similar

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<i>E.ME-2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements.</i>		<i>M.ME-2 Apply appropriate techniques, strategies, and formulas to solve problems involving measurements (including derived measurements and rates).</i>		<i>H.ME-2 Apply and analyze techniques at an appropriate level of precision and use formulas to quantify or interpret abstract events, objects, and situations.</i>
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
				7.ME.2e1 Solve one step real world problems related to scaling	H.ME.2b4 Apply the formula to the area of a sector (e.g., area of a slice of pie)
			6.ME.2a3 Apply the formula to find the area of triangles	7.ME.2e2 Solve one step problems involving unit rates associated with ratios of fractions	H.ME.2b5 Apply the formula of geometric figures to solve design problems (e.g., designing an object or structure to satisfy physical restraints or minimize cost)
				8.ME.2f1 Apply the Pythagorean Theorem to determine lengths/ distances in real-world situations	

Progress Indicator: E.ME.2a applying non-standard and common standard units to measure (length, height, weight, time)		
Core Content Connectors: K	CCSS Domain/Cluster	Common Core State Standard
No CCCs developed for this PI		No CCSS linked
Progress Indicator: E.ME.2b selecting tools and using units of measures appropriately and consistently, with no gaps or overlaps in the technique of measuring		
No CCCs developed for this PI		No CCSS linked
Progress Indicator: E.ME.2c recognizing situations that require precision and those where an estimation or proportional matching is appropriate		
No CCCs developed for this PI		No CCSS linked
Progress Indicator: E.ME.2d describing a unit as an amount/quantity (rather than an object or a mark on a scale)		
No CCCs developed for this PI		No CCSS linked

Progress Indicator: E.ME.2a applying non-standard and common standard units to measure (length, height, weight, time)		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.ME.2a1 Measure using copies of one object to measure another	Measurement and Data 1 MD Measure lengths indirectly and by iterating length units.	1.MD.2 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object (the length unit) end to end; understand that the lengths measurement of an object is the number of same size length units that span it with no gaps or overlaps. <i>Limit to context where the object being measure is spanned by a whole number of length units with no gaps or overlaps.</i>
1.ME.2a2 Use time to sequence up to 3 events, using a digital or analog clock	Measurement and Data 1 MD Tell and write time.	1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.
Progress Indicator: E.ME.2b selecting tools and using units of measures appropriately and consistently, with no gaps or overlaps in the technique of measuring		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.ME.2b1 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object end to end	Measurement and Data 1 MD Measure lengths indirectly and by iterating length units.	1.MD.2 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object (the length unit) end to end; understand that the lengths measurement of an object is the number of same size length units that span it with no gaps or overlaps. <i>Limit to context where the object being measure is spanned by a whole number of length units with no gaps or overlaps.</i>

Progress Indicator: E.ME2c recognizing situations that require precision and those where an estimation or proportional matching is appropriate		
No CCCs developed for this PI		No CCSS linked
Progress Indicator: E.ME2d describing a unit as an amount/quantity (rather than an object or a mark on a scale)		
No CCCs developed for this PI		No CCSS linked

Progress Indicator: E.ME.2a applying non-standard and common standard units to measure (length, height, weight, time)		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.ME.2a3 Estimate the length of an object using units of feet and inches	Measurement and Data 2 MD Measure and estimate lengths in standard units.	2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.
2.ME.2a4 Solve one step subtraction problems involving the difference of the lengths of 2 objects in standard length units	Measurement and Data 2 MD Measure and estimate lengths in standard units.	2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
Progress Indicator: E.ME.2b selecting tools and using units of measures appropriately and consistently, with no gaps or overlaps in the technique of measuring		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.ME.2b2 Select appropriate tools and demonstrate or identify appropriate measuring techniques	Measurement and Data 2 MD Measure and estimate lengths in standard units.	2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
Progress Indicator: E.ME2c recognizing situations that require precision and those where an estimation or proportional matching is appropriate		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.ME.2c1 Determine whether a situation calls for a precise measurement or an estimation		
Progress Indicator: E.ME2d describing a unit as an amount/quantity (rather than an object or a mark on a scale)		
No CCCs developed for this PI		No CCSS linked

Progress Indicator: E.ME.2e selecting and applying appropriate customary or metric units and tools to measure or estimate (liquid volume, mass, perimeter, area, time, and angles)		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.ME.2e1 Select appropriate tool for measurement: liquid volume, area, time, money	Measurement and Data 3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.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, e.g. by using drawings (such as a beaker with a measurement scale) to represent the problem.
3.ME.2e2 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch	Measurement and Data 3 MD Represent and interpret data.	3.MD.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.
3.ME.2e3 Measure to solve problems using number lines and ruler to 1 inch, ½ inch, or ¼ of an inch	Measurement and Data 3 MD Represent and interpret data.	3.MD.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.
Progress Indicator: E.ME.2h using a variety of strategies (decomposing complex shapes, using counting strategies, arrays, formulas) to estimate or measure area and perimeter (including irregular shapes/objects)		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.ME.2h1 Use addition to find the perimeter of a rectangle	Measurement and Data 3 MD Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	3.MD.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.
Progress Indicator: E.ME.2i selecting and using benchmarks to estimate measurements		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.ME.2i1 Estimate liquid volume	3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.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, e.g. by using drawings (such as a beaker with a measurement scale) to represent the problem.

Progress Indicator: E.ME.2e selecting and applying appropriate customary or metric units and tools to measure or estimate (liquid volume, mass, perimeter, area, time, and angles)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.ME.2e4 Select appropriate tool for measurement: mass, length, angles	Measurement and Data 4 MD Geometric measurement: understand concepts of angle and measure angles.	4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
4.ME.2e5 Construct a given angle	Measurement and Data 4 MD Geometric measurement: understand concepts of angle and measure angles.	4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
4.ME.2e6 Measure right angles using a tool (e.g., angle ruler, protractor)	Measurement and Data 4 MD Geometric measurement: understand concepts of angle and measure angles.	4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
Progress Indicator: E.ME.2f recognizing relative sizes of units of measure and making simple conversions within systems when solving problems (e.g., 12 in. = 1 ft)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.ME.2f1 Complete a conversion table for length and mass within a single system	Measurement and Data 4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.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. <i>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), ...</i>
Progress Indicator: E.ME.2g recognizing situations that require precision (money, time, distances, fractions, decimals) and those where an estimation is appropriate		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.ME.2g1 Determine whether a situation calls for a precise measurement or an estimation (distance, volume, mass, time, money)	Measurement and Data 3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.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, e.g. by using drawings (such as a beaker with a measurement scale) to represent the problem.

Progress Indicator: E.ME.2h using a variety of strategies (decomposing complex shapes, using counting strategies, arrays, formulas) to estimate or measure area and perimeter (including irregular shapes/objects)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.ME.2h1 Apply the formulas for area and perimeter to solve real world problems	<p>Measurement and Data</p> <p>3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.</p> <p>3 MD Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.</p> <p>4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</p>	<p>3.MD.7a Relate area to the operations of multiplication and addition.</p> <p>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.</p> <p>3.MD.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.</p> <p>4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. <i>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.</i></p>

Progress Indicator: M.ME.2a selecting and applying appropriate standard units, tools, and level of precision in real-world measurement problems (e.g., area, surface area, volume, rate)		
Core Content Connectors: 5	CCSS Domain/Cluster	Common Core State Standard
5.ME.2a1 Solve problems involving conversions of standard measurement units when finding area, volume, time lapse, or mass	<p>Measurement and Data</p> <p>5 MD Convert like measurement units within a given measurement system.</p>	<p>5.MD.1 Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems.</p>

Progress Indicator: M.ME.2b using a variety of strategies (decomposing complex shapes, using formulas and models) to measure area (triangles, quadrilaterals, polygons) and volume (rectangular prisms)		
Core Content Connectors: 5	CCSS Domain/Cluster	Common Core State Standard
5.ME.2b1 Use filling and multiplication to determine volume	Measurement and Data 5 MD Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
5.ME.2b2 Apply formula to solve one step problems involving volume	Measurement and Data 5 MD Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	5.MD.5b Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. b) Apply the formulas $V = l \times w \times h$ and $V = b \times h$ 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.
Progress Indicator: M.ME.2a selecting and applying appropriate standard units, tools, and level of precision in real-world measurement problems (e.g., area, surface area, volume, rate)		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.ME.2a2 Solve one step real world measurement problems involving unit rates with ratios of whole numbers when given the unit rate (3 inches of snow falls per hour, how much in 6 hours)	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3b 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. b) Solve unit rate problems including those involving unit pricing and constant speed. <i>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?</i>
6.ME.2a3 Apply the formula to find the area of triangles	Geometry 6 G Solve real-world and mathematical problems involving area, surface area, and volume.	6.G.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.

Progress Indicator: M.ME.2b using a variety of strategies (decomposing complex shapes, using formulas and models) to measure area (triangles, quadrilaterals, polygons) and volume (rectangular prisms)		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.ME.2b3 Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles, squares, triangles) to measure area	Geometry 6 G Solve real-world and mathematical problems involving area, surface area, and volume.	6.G.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.
6.ME.2b4 Decompose complex 3-D shapes into simple 3-D shapes to measure volume	Measurement and Data 5 MD Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	5.MD.5a 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.

Progress Indicator: M.ME.2c selecting and applying appropriate standard units and tools to measure to an appropriate level of precision		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.ME.2c1 Solve one step real world measurement problems involving area, volume, or surface area of two- and three-dimensional objects	Geometry 7 G Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	7.G.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.
Progress Indicator: M.ME.2d using various strategies (decomposing complex shapes, using formulas) to measure volume (cones, cylinders, spheres) and area and circumference of circles		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.ME.2d1 Apply formula to measure area and circumference of circles	Geometry 7 G Solve real-life and mathematical problems involving angle measure, area, surface area,	7.G.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.

	and volume.	
Progress Indicator: M.ME.2e solving simple problems involving scale factors, rates, and derived measures		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.ME.2e1 Solve one step real world problems related to scaling	Geometry 7 G Draw, construct, and describe geometrical figures and describe the relationships between them.	7.G.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.
7.ME.2e2 Solve one step problems involving unit rates associated with ratios of fractions	Ratios and Proportional Relationships 7 RP Analyze proportional relationships and use them to solve real-world and mathematical problems.	7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.</i>

Progress Indicator: M.ME.2d using various strategies (decomposing complex shapes, using formulas) to measure volume (cones, cylinders, spheres) and area and circumference of circles		
Core Content Connectors: 8	CCSS Domain/Cluster	Common Core State Standard
8.ME.2d2 Apply the formula to find the volume of 3-dimensional shapes (i.e., cubes, spheres, and cylinders)	Geometry 8 G Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Progress Indicator: M.ME.2f applying the Pythagorean Theorem to determine lengths/distances in real-world situations		
Core Content Connectors: 8	CCSS Domain/Cluster	Common Core State Standard
8.ME.2f1 Apply the Pythagorean Theorem to determine lengths/distances in real-world situations	8 G Understand and apply the Pythagorean Theorem.	8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Progress Indicator: H.ME.2a analyzing levels of precision, accuracy, and approximate error in measurement situations		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.ME.2a1 Describe the accuracy of measurement when reporting quantity (you can lessen your limitations by measuring precisely)	Quantities N Q Reason quantitatively and use units to solve problems.	N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Progress Indicator: H.ME.2b using techniques of measurement, estimating, or calculating to compare or analyze two- and three-dimensional figures and their parts		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.ME.2b1 Determine the dimensions of a figure after dilation	Similarity, Right Triangles, and Trigonometry G SRT Understand similarity in terms of similarity transformations.	G.SRT.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.
H.ME.2b2 Determine if 2 figures are similar	Similarity, Right Triangles, and Trigonometry G SRT Understand similarity in terms of similarity transformations.	G.SRT.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.
H.ME.2b3 Describe or select why two figures are or are not similar	Similarity, Right Triangles, and Trigonometry G SRT Understand similarity in terms of similarity transformations.	G.SRT.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.
H.ME.2b4 Apply the formula to the area of a sector (e.g., area of a slice of pie)	Circles G C Find arc lengths and areas of sectors of circles.	G.C.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.
H.ME.2b5 Apply the formula of geometric figures to solve design problems (e.g., designing an object or structure to satisfy physical restraints or minimize cost)	Modeling with Geometry G MG Apply geometric concepts in modeling situations.	G.MG.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).