Texas Education Agency

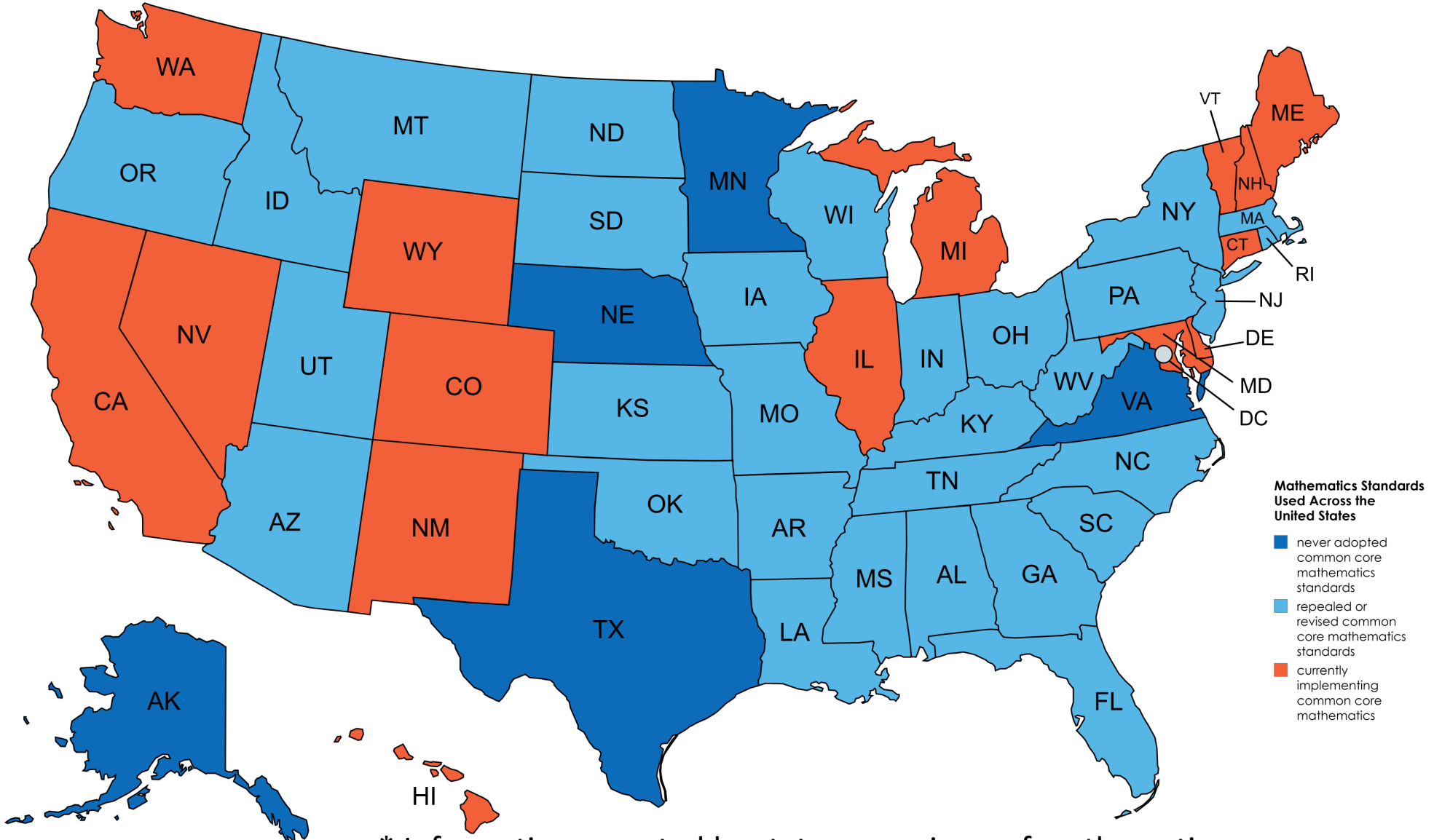
Ad Hoc Committee on Mathematics Instruction Framework Meeting 2

January 30, 2024

Topics

- Mathematics education across the US
- History of the Texas mathematics TEKS
  - Standards development in 2012
  - Comparison to previous standards
- Research/Connections
  - National Mathematics Advisory Panel Final
  - NCTM Curriculum Focal Points
  - Singapore Mathematics Framework
  - Texas College and Career Readiness Standards (CCRS)

Mathematics Standards across the United States



Created with mapchart.net

* Information reported by state supervisors of mathematics

Texas Performance on NAEP Mathematics in 2019, 2022, and 2024

NAEP Mathematics Data

Grade 4			Grade 8		
2019	2022	2024	2019	2022	2024
DoDEA - 250	DoDEA - 250	DoDEA - 251	Massachusetts - 294	DoDEA - 292	DoDEA - 291
Minnesota	Wyoming	Massachusetts	DoDEA	Massachusetts	Massachusetts
Massachussetts	Massachusetts	Florida	New Jersey	Utah	Wisconsin
Virginia	Nebraska	Wyoming	Minnesota	Idaho	Minnesota
Florida	Florida	New Hampshire	Wisconsin	South Dakota	Utah
New Jersey	Wisconsin	Utah	New Hampshire	Wisconsin	New Jersey
Wyoming	North Dakota	North Dakota	South Dakota	Wyoming	South Dakota
Indiana	Iowa	Minnesota	Virginia	New Jersey	Nebraska
New Hampshire	Utah	Texas - 241	Vermont	Minnesota	North Dakota
Pennsylvania	New Hampshire	Indiana	Wyoming	Nebraska	New Hampshire
Utah	New Jersey	New Jersey	Connecticut	Virginia	Montana
Nebraska	Indiana	South Dakota	Idaho	Indiana	Ohio
Texas - 244	Minnesota	Tennessee	Washington	New Hampshire	Wyoming
Connecticut	South Dakota	Ohio	Ohio	North Dakota	Indiana
North Dakota	Texas - 239	Hawaii	Indiana	Montana	Colorado
Idaho	Montana	Wisconsin	North Dakota	Iowa	Idaho
Colorado	Ohio	Mississippi	Pennsylvania	Connecticut	Illinois
Wisconsin	Pennsylvania	Colorado	Nebraska	Vermont	Connecticut
North Carolina	Illinois	Connecticut	Utah	Washihngton	Pennsylvania
South Dakota	Hawaii	North Carolina	Colorado	Ohio	Tennessee
Ohio	Virginia	Montana	Montana	Illinois	North Carolina
Montana	Connecticut	Idaho	North Carolina	Colorado	Vermont
Maine	Tennessee	Nebraska	Illinois	Pennsylvania	Virginia
Mississippi	Idaho	Pennsylvania	Maine	New York	Iowa
Iowa	Colorado	Virginia	Kansas	North Carolina	Kansas
National Avg - 240	North Carolina	Kentucky	Iowa	National Avg - 273	Washington
Tennessee	Kansas	South Carolina	National Avg - 281	Texas - 273	Maine
Washington	Washington	Washington	Missouri	Michigan	National Avg - 272
Kansas	Georgia	National Avg - 237	New York	Maine	New York
Rhode Island	National Avg - 235	Rhode Island	Michigan	Missouri	Kentucky
Delaware	Vermont	Kansas	Maryland	Tennessee	Missouri
Kentucky	South Carolina	Iowa	Tennessee	Kansas	Hawaii
Vermont	Rhode Island	Alabama	Arizona	Georgia	Michigan
Hawaii	Kentucky	Georgia	Texas - 280	Florida	Rhode Island
Maryland	Mississippi	Illinois	Oregon	Arizona	Arizona
Missouri	Maine	Michigan	Georgia	Rhode Island	Texas - 270

NAEP Top Performers

NAEP 2022	
Grade 4 Mathematics	**Grade 8 Mathematics**
Department of Defense Education Agency (DODEA)	Department of Defense Education Agency (DODEA)
Wyoming	Massachusetts
Massachusetts	Utah
Nebraska	Idaho

NAEP 2024	
Grade 4 Mathematics	**Grade 8 Mathematics**
Department of Defense Education Agency (DODEA)	Department of Defense Education Agency (DODEA)
Massachusetts	Massachusetts
Florida	Minnesota
Wyoming	Utah

Analysis of State Standards

- In which grade levels are different concepts taught?
- What other information is embedded in the state standards?
  - Examples
  - Clarifications

Analysis of State Standards

- What other information is embedded in the state standards?

Examples

- DoDEA*
- Massachusetts*
- Utah*
- Idaho*
- Florida

* **A. Analyze proportional relationships and use them to solve real-world and mathematical problems.**

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 ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.

MA.6.AR.3.2 Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.

Example: Tamika can read 500 words in 3 minutes. Her reading rate can be described as $\frac{500\ words}{3\ minutes}$ which is equivalent to the unit rate of $166\frac{2}{3}$ words per minute.

*The same examples are use in the standards for states marked with an asterisk.

Analysis of State Standards

- What other information is embedded in the state standards?
  Clarifications – provide guidance to promote consistency in instruction and assessment

  MA.2.NSO.1.3 Plot, order and compare whole numbers up to 1,000.

  Benchmark Clarifications:

  Clarification 1: When comparing numbers, instruction includes using a number line and using place values of the hundreds, tens and ones digits.

  Clarification 2: Within this benchmark, the expectation is to use terms (e.g., less than, greater than, between or equal to) and symbols (<, > or =).

  MA.6.AR.3.2 Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.

  Benchmark Clarifications:

  Clarification 1: Instruction includes using manipulatives, drawings, models and words and making connections between ratios, rates and unit rates.

  Clarification 2: Problems will not include conversions between customary and metric systems.

Comparing Texas to Top Performers—Patterns

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Patterns	One more/one less (K) not identified explicitly as a pattern	Counting one more (K) not identified explicitly as a pattern	Counting (one more) patterns (k)	Counting one more (K) not identified explicitly as a pattern	Counting one more (K) not identified explicitly as a pattern	One more/one less (K) not identified explicitly as a pattern	One more/one less (K)
	Skip counting (1) not identified explicitly as a pattern	Skip counting (2) not identified explicitly as a pattern	Skip counting (2)	Skip counting (1)	Skip counting (2) not identified explicitly as a pattern	Skip counting (2) not identified explicitly as a pattern	Skip counting (1, 2)
	10 more/10 less (1) and 100 more/100 (2) less not explicitly identified as arithmetic patterns	10 more/10 less (1) and 100 more/100 (2) less not explicitly identified as arithmetic patterns	Arithmetic patterns of 10 more/10 less (1)	10 more/10 less (1) and 100 more/100 (2) less not explicitly identified as arithmetic patterns	10 more/10 less (1) and 100 more/100 (2) less not explicitly identified as arithmetic patterns	10 more/10 less (1) and 100 more/100 (2) less not explicitly identified as arithmetic patterns	
		Arithmetic patterns (3)	Arithmetic patterns (3)		Arithmetic patterns (3)	Arithmetic patterns (3)	Arithmetic sequences(4)
	Rules for patterns (4,5)	Rules for patterns (4, 5)	Rules for patterns (4, 5)	Rules for patterns (5)	Rules for patterns (4, 5)	Rules for patterns (4)	Rules for patterns (4, 5)
	Patterns in ordered pairs (5) Base 10 relationships (4), not explicitly identified as a pattern in the student expectation.	Patterns in ordered pairs and base ten patterns (5)	Patterns in ordered pairs and base ten patterns (5)	Patterns in ordered pairs (5) base ten relationships (5) not explicitly identified as a pattern in the student expectation	Patterns in ordered pairs and base ten patterns (5)	Patterns in ordered pairs and base ten patterns (5)	Patterns in ordered pairs and base ten patterns (5)
	Distribution summaries (6), not explicitly identified as a pattern in the student expectation.	Distribution patterns (6)	Distribution patterns (6)	Distribution summaries (HS), not explicitly identified as a pattern in the student expectation.	Distribution patterns (6)	Distribution patterns (6)	Distribution patterns (6)
	Description of data to address questions of association (8), not explicitly identified as a pattern in the student expectation.	Patterns of association (8)	Patterns of association (8)	Patterns of association (8)	Patterns of association (8)	Patterns of association (8)	Patterns of association (8)
	The term 'pattern' is within the Algebraic Reasoning KS that applies to all the student expectations in the KS, but only explicit discussion of patterns in student expectations in grade 4 and grade 5.						

Comparing Texas to Top Performers—Operations

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Order of Operations	concept of perfect squares (4)						
		factors and multiples (4)	factors and multiples (4)	factors and multiples (5)	factors and multiples (4)		factors and multiples (6)
		greatest common factor and least common multiple (6)	greatest common factor and least common multiple (6)	common factor and common multiple (6)	common factor and common multiple (6)	common factor and common multiple (6)	greatest common factor and least common multiple (6)
	Parenthesis and braces (4)	Parenthesis, brackets, and braces (5)	Parenthesis, brackets, and braces (5)		Parenthesis, brackets, and braces (5)	Parenthesis, brackets, and braces (5)	Parenthesis, brackets, and braces (5)
	order of operation except exponents (5)	all order of operations (6)	all order of operations (6)	all order of operations (5)	all order of operations (6)	all order of operations (6)	all order of operations (6)
	all order of operations (6)						
	absolute value (6)	absolute value (6)	absolute value (6)	absolute value (6)	absolute value (6)	absolute value (6)	
	approximations of square roots (8)	square and cube roots (8)	square and cube roots (8)	square and cube roots (8)	square and cube roots (8)	square roots and exponents (HS)	square and cube roots (8)
	square roots and exponents (HS)	Exponents (8)	Exponents (8)	exponents (8)	exponents (8)		exponents (8)

Comparing Texas to Top Performers—Numbers and Operations and Algebraic Thinking

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Addition and Subtraction	Whole Numbers						
	sums up to 10 and differences within 10 (k)	sums up to 10 and differences within 10 (k)	Sums and differences to 5 (k)	sums up to 10 and differences within 10 (k)	sums up to 10 and differences within 10 (k)	sums up to 10 and differences within 10 (k)	sums up to 10 and differences within 10 (k)
	Up to 20 (1)	Up to 20 (1)	Up to 20 (1)	Up to 20 (1)	Up to 20 (1)	Up to 100 (1)	Up to 100 (1)
	Up to 1000 (2)	Up to 1000 (2)	Up to 1000 (2)	Up to 1000 (2)	Up to 1000 (2)	Up to 1000 (2)	Up to 1000 (2)
	Rational Numbers						
	Fractions and decimals (4, 5)	Fractions (4)	Fractions (4)	Fractions (4)	Fractions (4)	Fractions and decimals (5)	Fractions and decimals (5)
		Fractions and decimals (5)	Fractions and decimals (5)	Fractions and decimals (5)	Fractions and decimals (5)		
	Expressions						
	Like terms (6)	Like terms (6)	Like terms (6, 7)	Like terms (6)	Like terms (6)	Like terms (6)	Like terms (6)
	Polynomials (HS)	Linear polynomials (7)	Linear polynomials (7)	Polynomials (HS)	Polynomials (HS)	Linear polynomials (7)	Linear polynomials (7)

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Mulitplication and Division	Whole Numbers						
	Contextual multiplication or division (2)	Contextual multiplication or division (2)	Contextual multiplication or division (2)	Contextual multiplication or division (2)	Multiplication/ division (3–5)	Multiplication/ division (3–5)	Contextual multiplication or division (2)
	Recall multiplication /division facts (3)	Recall multiplication /division facts (3)	Recall multiplication /division facts (3)	Recall multiplication /division facts (3)			Recall multiplication /division facts (3)
	Rational Numbers						
	Decimals (4)	Decimals (5)	Decimals (5)	Decimals (5)	Decimals (5)	Decimals (5)	Decimals (5)
	Unit fractions (5)	Unit fractions & whole number x fraction (4)	Unit fractions & whole number x fraction (4)	Unit fractions & whole number x fraction (4)	Unit fractions & whole number x fraction (4, 5)	Unit fractions & whole number x fraction (5)	Whole number x fraction (4)
	Positive fractions (6)	Positive fractions (5)	Positive fractions (5)	Positive fractions (5)	Positive fractions (5)	Positive fractions (6)	Positive fractions (5)
	Integer multiplication (6)	Integer multiplication (7)	Integer multiplication (7)	Integer multiplication (7)	Integer multiplication (7)	Integer multiplication (7)	Integer multiplication (7)
	All Rational number (7)	All Rational number (7)	All Rational number (6)	All Rational number (6)	All Rational number (6)	All Rational number (6)	All Rational number (6)
	Polynomials (HS)	Polynomials (HS)	Polynomials (HS)	Polynomials (HS)	Polynomials (HS)	Polynomials (HS)	Polynomials (HS)

Comparing Texas to Top Performers—Measurement, Probability, and Statistics

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Measurement	Concepts of measurement (K-2)	Concepts of measurement (K)	Concepts of measurement (K)	Concepts of measurement (K)	Concepts of measurement (K)	Concepts of measurement (K)	Concepts of measurement (K)
	Linear (1, 2, 4, 5)	Linear (1, 2)	Linear (1, 2)	Linear (1, 2)	Linear (1, 2)	Linear (1, 2)	Linear (1, 2)
	Capacity (3, 4, 5)	Capacity (3)	Capacity (3)	Capacity (3)	Capacity (3)	Capacity (3)	Capacity (3)
	Weight/Mass (3–5)	Weight/Mass (4)	Weight/Mass (4)	Weight/Mass (4)	Weight/Mass (4)	Weight/Mass (4)	Weight/Mass (4)
	Time (1–4)	Time (1–4)	Time (1–3)	Time (K–4)	Time (1–4)	Time (1–4)	Time (1–3)
	Conversions within systems (4–6)	Conversion within systems (4–5)	Conversion within systems (4–5)	Conversion within systems (4–5)	Conversion within systems (5)	Conversion within systems (5)	Conversion within systems (4)
	Conversion between systems (7)	Conversion between systems (6)	Conversion between systems (6)	Conversion between systems (6)	Conversion between systems (6)	Conversion between systems (6)	Conversion between systems (6)
	Lack of focus on precision	Tolerance and measuring to precision (H.S.)	Tolerance and measuring to precision (H.S.)	Tolerance and measuring to precision (H.S.)	Tolerance and measuring to precision (H.S.)	Measuring to precision (H.S.)	Measuring to precision (H.S.)
							Fractional measurement (4)

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Statistics and Probability	Statistical variability and distributions (6–8)	Statistical variability and distributions (6)	Statistical variability and distributions (6)		Statistical variability and distributions (6)	Statistical variability and distributions (6)	Statistical variability and distributions (6)
				Calculating probability (7)			
	Random sampling (7,8)	Random sampling and probability models (7)	Random sampling and probability models (7)		Random sampling and probability models (7)	Random sampling and probability models (7)	Random sampling and probability models (7)
		Patterns of association in bivariate data (8)	Patterns of association in bivariate data (8)		Patterns of association in bivariate data (8)	Patterns of association in bivariate data (8)	Patterns of association in bivariate data (8)
	Theoretical and experimental probability (7)			Theoretical and experimental probability (6)			

Comparing Texas to Top Performers—Geometry

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Geometry	2D/3D figure attributes and classification (K–5)	2D/3D figure attributes and classification (K–5)	2D/3D figure attributes and classification (K–4)	2D/3D figure attributes and classification (K–5)	2D/3D figure attributes and classification (K–5)	2D/3D figure attributes and classification (K–4	2D/3D figure attributes and classification (K–4
	Compose/decompose/partition (1–3)	Compose/decompose/partition (K–3)	Compose/decompose/partition (K–3)	Compose/decompose/partition (K–2)	Compose/decompose/partition (K–3)	Compose/decompose/partition (K–3)	Compose/decompose/partition (K–3)
	Symmetry (4)	Symmetry (4)	Symmetry (4)	Symmetry (4)	Symmetry (4)	Symmetry (4)	Symmetry (4)
	Coordinate Plane (5,6, 8)	Coordinate Plane (5,6)	Coordinate Plane (5, 6)	Coordinate Plane (5–8)	Coordinate Plane(5–8)	Coordinate Plane (5–8)	Coordinate Plane (5–8)
	Congruence (8)	Congruence (8)	Congruence (8)	Congruence (8)	Congruence (8)	Congruence (8)	Congruence (8)
	Geometric Measurements						
	Area and perimeter (3–8)	Area and perimeter (3, 6)	Area and perimeter (3, 6, 7)	Area and perimeter (3–8)	Area and perimeter (3, 4, 6, 7)	Area and perimeter (3, 4, 6)	Area and perimeter (3, 4, 6)
	Volume (5–8)	Volume (5–8)	Volume (5–8)	Volume (5–8)	Volume (5–8)	Volume (5–8)	Volume (5–8)
	Surface Area (7,8)	Surface Area (6, 7)	Surface Area (6,7)	Surface Area (6, 7)	Surface Area (6, 7)	Surface Area (6–8)	Surface Area (6–8)
	Circumference (7+)	Circumference (7)	Circumference (7)	Circumference (7)	Circumference (7)	Circumference (7)	Circumference (7)
	Pythagorean Theorem (8)	Pythagorean Theorem (8)	Pythagorean Theorem (8)	Pythagorean Theorem (8)	Pythagorean Theorem (8)	Pythagorean Theorem (8)	Pythagorean Theorem (8)
		Relative position (K)	Relative position (K)	Relative position (K)	Relative position (K)	Relative position (K)	Relative position (K)
	3D nets for finding area(7)	3D nets (6+)	3D nets (6+)	3D nets (6+)	3D nets (6+)	3D nets (6+)	3D nets (6+)

Comparing Texas to Top Performers–Other topics

	Texas	DODEA	Massachusetts	Nebraska	Utah	Wyoming	Idaho
Process Standards (All organizations reference NRC's Adding it Up and/or NCTM's process standards documents)	7 process standards	8 process standards	8 process standards	5 process standards	8 process standards	8 process standards	8 process standards
Personal Financial Literacy Strand	Strand in K-8 math	None	None	None	None	None	None

History of Mathematics Education Research and TEKS Development

1980

- NCTM published *An Agenda for Action*.
- Ten recommendations focusing on the fundamental need of students to learn how to solve problems.

1989

- NCTM published *Curriculum and Evaluation Standards for School Mathematics*.
- Provided direction for states in developing curriculum guidelines.

1998

- Mathematics TEKS first implemented.

2000

- NCTM published *Principles and Standards for School Mathematics*
  - Comprehensive reference on developing mathematical knowledge across the grades through content strands.

History of Mathematics Education Research and TEKS Development

Texas Education Agency

2001

- NRC published *Adding it Up*
  - Comprehensive framework for understanding mathematical proficiency, which includes five strands: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition

2006

- Secondary TEKS revision to address alignment to College and Career Readiness Standards
- NCTM published *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics*.
  - Groupings and descriptions of important mathematical concepts in each grade level

2008

- National Mathematics Advisory Panel published their final report.
  - Included critical areas of focus for K-8

2012

- Current mathematics TEKS adopted.

TEKS Comparison: 1998 to now – Process Standards

1998 TEKS	Current TEKS
11.A identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics	1.A apply mathematics to problems arising in everyday life, society, and the workplace;
11.B use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness	1.B use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
11.C select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem and	
11.D select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems.	1.C select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

TEKS Comparison: 1998 to now – Process Standards

1998 TEKS	Current TEKS
12.A communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models; and	1.D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
12.B evaluate the effectiveness of different representations to communicate ideas.	1.E create and use representations to organize, record, and communicate mathematical ideas;
13.A make conjectures from patterns or sets of examples and nonexamples; and	1.F analyze mathematical relationships to connect and communicate mathematical ideas; and
13.B Validate his/her conclusions using mathematical properties and relationships.	1.G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

TEKS Comparison: 1998 to now – Content Standard Shifts

Grade 8 – Mathematics

	Old TEKS – Number, Operation, and Quantitative Reasoning Strand	Current TEKS (2012)	Supporting Information	Notes
●+	8(1)(A) **Number, operation, and quantitative reasoning.** The student understands that different forms of numbers are appropriate for different situations. **The student is expected to compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals.**	8(2)(D) **Number and operations.** The student applies mathematical process standards to represent and use real numbers in a variety of forms. **The student is expected to order a set of real numbers arising from mathematical and real-world contexts.**	The revised SE was removed the obvious restatement of rational numbersas "integers, percents, and positive and negative fractions and decimals." The skill of comparing is a needed skill for ordering, so the ordering could include comparing. The revised SE is an extension of the current SE related to ordering numbers. A set of numbers to be ordered may include irrational numbers.	
+		8(2)(A) **Number and operations.** The student applies mathematical process standards to represent and use real numbers in a variety of forms. **The student is expected to extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of real numbers.**	When creating sets and subsets of real numbers, students need only distinguish between rational numbers and irrational numbers. For example, students are not expected to differentiate between transcendental real numbers and algebraic real numbers. Subsets of real numbers include counting numbers, whole numbers, integers, rational numbers, and irrational numbers. A Venn diagram is an applicable visual representation.	
−	8(1)(B) **Number, operation, and quantitative reasoning.** The student understands that different forms of numbers are appropriate for different situations. **The student is expected to select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships.**		The content of this SE was moved to grade 7 and is separated into 3 SEs: *Number and operations* 7(3)(A) 7(3)(B) *Proportionality* 7(4)(D)	
○	8(1)(C) **Number, operation, and quantitative reasoning.** The student understands that different forms of numbers are appropriate for different situations. **The student is expected to approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations (such as π, √2).**	8(2)(B) **Number and operations.** The student applies mathematical process standards to represent and use real numbers in a variety of forms. **The student is expected to approximate the value of an irrational number, including π and square roots of numbers less than 225, and locate that rational number approximation on a number line.**	Approximations are now limited to be those values that are less than $\sqrt{225}$. The current SE 7(1)(C) has been subsumed in the revised SE 8(2)(B). Though locating the rational number approximations of square roots on a number line has been added, it is not a new skill for students to place a rational number on a number line. The underlying processes and skills of the current TEKS expect students to use graphical and numeric models. A number line is such a model. This complements the ordering of real numbers in 8(2)(D). The use of a calculator to approximate square roots has been removed.	

Side-by-Side Comparison Documents

Texas Education Agency

Evidence of effective mathematics education practices in the TEKS

Foundations for success: The National Mathematics Advisory Panel Final Report

Benchmarks for the Critical Foundations	Relevant TEKS
By the end of Grade 3, students should be proficient with the addition and subtraction of whole numbers.	3.3.A solve with fluency one-step and two-step problems involving addition and subtraction within 1,000 using strategies based on place value, properties of operations, and the relationship between addition and subtraction
By the end of Grade 5, students should be proficient with multiplication and division of whole numbers.	5.3.B multiply with fluency a three-digit number by a two-digit number using the standard algorithm. 6.3.E multiply and divide positive rational numbers fluently
By the end of Grade 4, students should be able to identify and represent fractions and decimals, and compare them on a number line or with other common representations of fractions and decimals.	4.3.G represent fractions and decimals to the tenths or hundredths as distances from zero on a number line
By the end of Grade 5, students should be proficient with comparing fractions and decimals and common percents, and with the addition and subtraction of fractions and decimals.	4.4.A add and subtract whole numbers and decimals to the hundredths place using the standard algorithm. 6.5.C use equivalent fractions, decimals, and percents to show equal parts of the same whole
By the end of Grade 6, students should be proficient with multiplication and division of fractions and decimals.	6.3.E multiply and divide positive rational numbers fluently
By the end of Grade 6, students should be proficient with all operations involving positive and negative integers.	6.3.D add, subtract, multiply, and divide integers fluently
By the end of Grade 7, students should be proficient with all operations involving positive and negative fractions.	7.3.A add, subtract, multiply, and divide rational numbers fluently
By the end of Grade 7, students should be able to solve problems involving percent, ratio, and rate and extend this work to proportionality.	7.4.D solve problems involving ratios, rates, and percents, including multi-step problems involving percent increase and percent decrease, and financial literacy problems

Foundations for success: The National Mathematics Advisory Panel Final Report

Benchmarks for the Critical Foundations	Relevant TEKS
By the end of Grade 5, students should be able to solve problems involving perimeter and area of triangles and all quadrilaterals having at least one pair of parallel sides (i.e., trapezoids).	5.4.H (polygons) represent and solve problems related to perimeter and/or area and related to volume 6.8.D determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers
By the end of Grade 6, students should be able to analyze the properties of two-dimensional shapes and solve problems involving perimeter and area and analyze the properties of three-dimensional shapes and solve problems involving surface area and volume.	*Two-dimensional shapes* 5.4.H represent and solve problems related to perimeter and/or area and related to volume 6.8.D determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers *Three-dimensional shapes* 5.6.B determine the volume of a rectangular prism with whole number side lengths in problems related to the number of layers times the number of unit cubes in the area of the base 6.8.C write equations that represent problems related to the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers 6.8.D determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers
By the end of Grade 7, students should be familiar with the relationship between similar triangles and the concept of the slope of a line.	8.4.A use similar right triangles to develop an understanding that slope, m, given as the rate comparing the change in y- values to the change in x- values, (y2 - y1) / (x2 - x1), is the same for any two points (x1 , y1) and (x2, y2) on the same line

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics

"Organizing a curriculum around these [Curriculum] focal points, with a clear emphasis on the processes that Principles and Standards addresses in the Process Standards—communication, reasoning, representation, connections, and, particularly, problem solving—can provide students with a connected, coherent, ever expanding body of mathematical knowledge and ways of thinking. Such a comprehensive mathematics experience can prepare students for whatever career or professional path they may choose as well as equip them to solve many problems that they will face in the future. "

"Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics provides one possible response to the question of how to organize curriculum standards within a coherent, focused curriculum, by showing how to build on important mathematical content and connections identified for each grade level, pre-K–8."

- National Council of Teachers of Mathematics. *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*. Reston, VA: National Council of Teachers of Mathematics, 2006.

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics

"Curriculum focal points are important mathematical topics for each grade level, pre-K–8. These areas of instructional emphasis can serve as organizing structures for curriculum design and instruction at and across grade levels. The topics are central to mathematics: they convey knowledge and skills that are essential to educated citizens, and they provide the foundations for further mathematical learning. Because the focal points are core structures that lay a conceptual foundation, they can serve to organize content, connecting and bringing coherence to multiple concepts and processes taught at and across grade levels. They are indispensable elements in developing problem solving, reasoning, and critical thinking skills, which are important to all mathematics learning"

"For inclusion in Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics, a focal point had to pass three rigorous tests:

- Is it mathematically important, both for further study in mathematics and for use in applications in and outside of school?
- Does it "fit" with what is known about learning mathematics?
- Does it connect logically with the mathematics in earlier and later grade levels?"

- National Council of Teachers of Mathematics. *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*. Reston, VA: National Council of Teachers of Mathematics, 2006.

Texas Response to Curriculum Focal Points: Evidence of effective mathematics education practices in the TEKS

"The Texas Response to Curriculum Focal Points Revised 2013 was created directly from the revised TEKS for K–8 mathematics. In the revised TEKS document, each introductory section identifies a few focal areas. These designated areas were used as a beginning point for sorting the TEKS at each grade level into three or four categories, each category based on a common mathematical idea to which all the TEKS in that group were related.

The few TEKS statements that did not fit into one of the three or four focal points in a grade level are listed at the end of each grade-level section and are labeled as connections. This placement does not indicate that these TEKS should be ignored; they either reinforce learning begun in an earlier grade or provide an early experience for development in a later grade. However, they are not meant to be the focus of instruction for that year. "

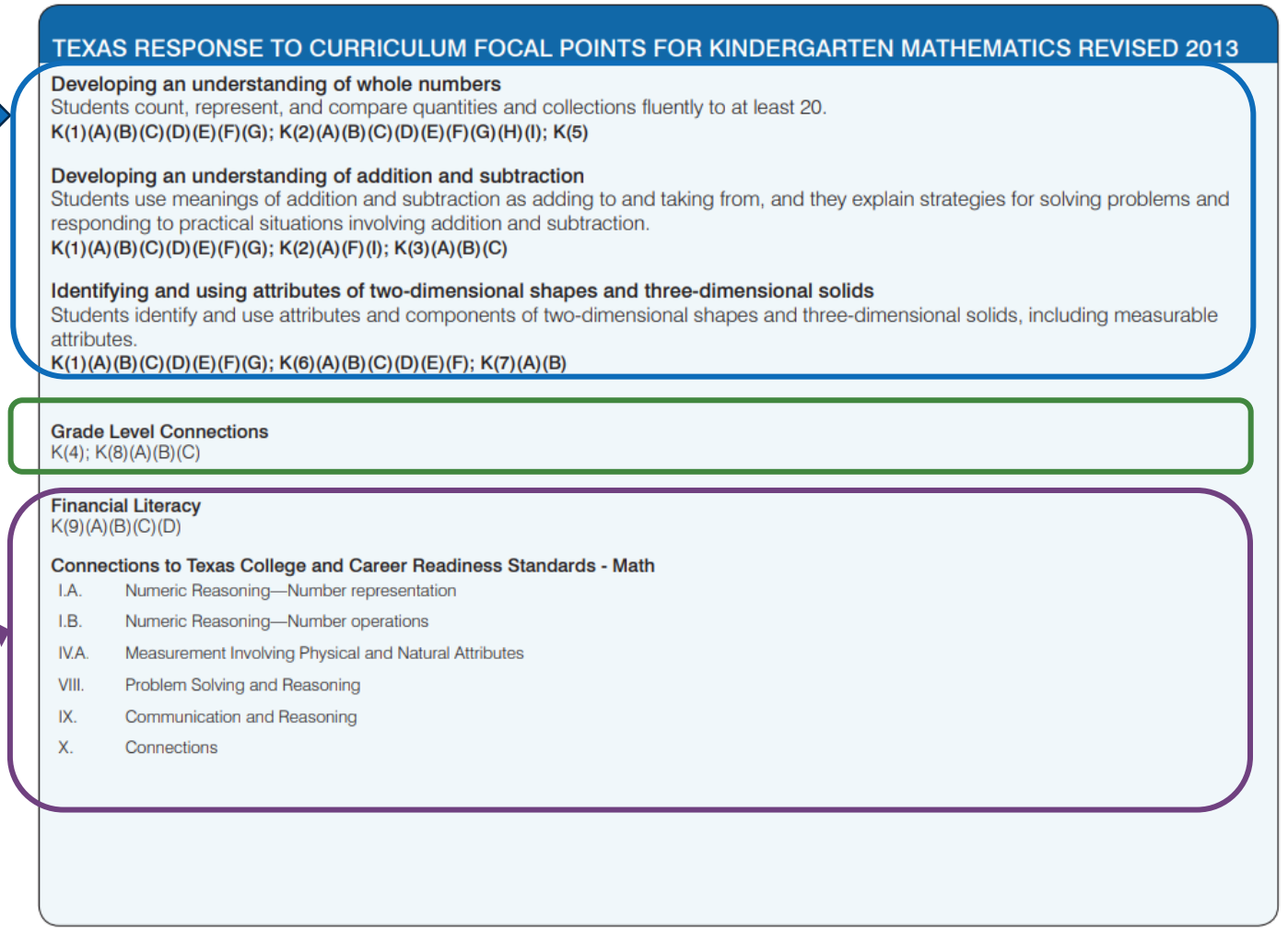
Texas Response to Curriculum Focal Points

Texas Response to Curriculum Focal Points: Evidence of effective mathematics education practices in the TEKS

At the beginning of each grade, there is a summary page that presents the three or four focal points for that grade level, including the title, description, and list of related TEKS.

Below the focal points are listed the TEKS for that grade that have been identified as connections.

In addition, the financial literacy TEKS for that grade and the major components of the Texas College and Career Readiness Standards in Mathematics that directly relate to that grade's content are listed.



TEXAS RESPONSE TO CURRICULUM FOCAL POINTS FOR KINDERGARTEN MATHEMATICS REVISED 2013

Developing an understanding of whole numbers
Students count, represent, and compare quantities and collections fluently to at least 20.
K(1)(A)(B)(C)(D)(E)(F)(G); K(2)(A)(B)(C)(D)(E)(F)(G)(H)(I); K(5)

Developing an understanding of addition and subtraction
Students use meanings of addition and subtraction as adding to and taking from, and they explain strategies for solving problems and responding to practical situations involving addition and subtraction.
K(1)(A)(B)(C)(D)(E)(F)(G); K(2)(A)(F)(I); K(3)(A)(B)(C)

Identifying and using attributes of two-dimensional shapes and three-dimensional solids
Students identify and use attributes and components of two-dimensional shapes and three-dimensional solids, including measurable attributes.
K(1)(A)(B)(C)(D)(E)(F)(G); K(6)(A)(B)(C)(D)(E)(F); K(7)(A)(B)

Grade Level Connections
K(4); K(8)(A)(B)(C)

Financial Literacy
K(9)(A)(B)(C)(D)

Connections to Texas College and Career Readiness Standards - Math

I.A.	Numeric Reasoning—Number representation
I.B.	Numeric Reasoning—Number operations
IV.A.	Measurement Involving Physical and Natural Attributes
VIII.	Problem Solving and Reasoning
IX.	Communication and Reasoning
X.	Connections

Comparison of NCTM Curriculum Focal Points and Texas Response to Curriculum Focal Points

Texas Education Agency

Evidence of effective mathematics education practices in the TEKS

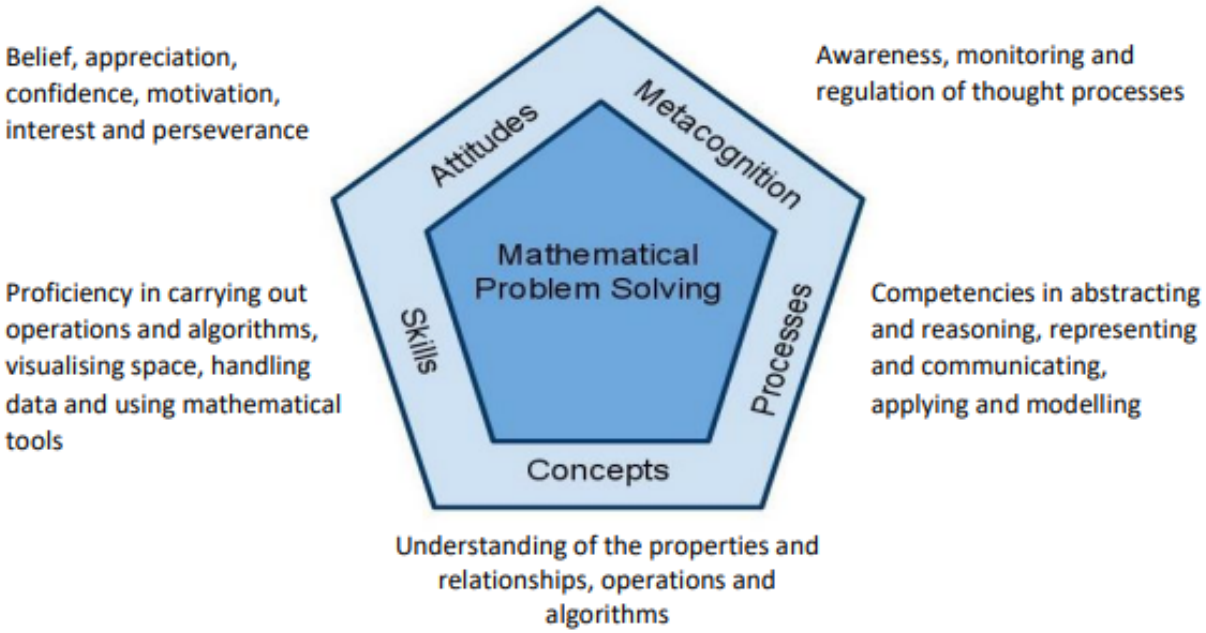
	NCTM Curriculum Focal Points	Texas Response to Curriculum Focal Points
Kindergarten	Representing, comparing, and ordering whole numbers and joining and separating sets	Developing an understanding of whole numbers
		Developing an understanding of addition and subtraction
	Describing shapes and space	Identifying and using attributes of two-dimensional shapes and three-dimensional solids
	Ordering objects by measurable attributes	
Grade 1	Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts	Solving problems involving addition and subtraction
	Developing an understanding of whole number relationships, including grouping in tens and ones	Developing an understanding of place value
	Composing and decomposing geometric shapes	Analyzing attributes of two-dimensional shapes and three-dimensional solids
		Developing the understanding of length
Grade 2	Developing an understanding of the base-ten numeration system and place-value concepts	Developing proficiency in the use of place value within the base-10 numeration system
	Developing quick recall of addition facts and related subtraction facts and fluency with multidigit addition and subtraction	Using place value and properties of operations to solve problems involving addition and subtraction of whole numbers within 1,000
	Developing an understanding of linear measurement and facility in measuring lengths	Measuring length
		Applying knowledge of two-dimensional shapes and three-dimensional solids, including exploration of early fraction concepts
Grade 3		Understanding and applying place value and properties of operations to solve problems involving addition and subtraction of whole numbers within 1,000
	Developing understandings of multiplication and division and strategies for basic multiplication facts and related division facts	Solving problems with multiplication and division within 100
	Developing an understanding of fractions and fraction equivalence	Understanding fractions as numbers and representing equivalent fractions
	Describing and analyzing properties of two-dimensional shapes	Describing characteristics of 2-D and 3-D geometric figures, including measurable attributes

Singapore Mathematics Framework

Mathematical Problem Solving

Problems may come from everyday contexts or future work situations, in other areas of study, or within mathematics itself. They include straightforward and routine tasks that require selection and application of the appropriate concepts and skills, as well as complex and non-routine tasks that requires deeper insights, logical reasoning and creative thinking. General problem-solving strategies, e.g. Pólya's 4 steps to problem solving and the use of heuristics, are important in helping one tackle non-routine tasks systematically and effectively.

Mathematics Curriculum Framework



Comparison of Singapore Standards to TEKS: Evidence of effective mathematics education practices in the TEKS

Singapore Concepts and Skills	TEKS#	Student Expectation
PRIMARY ONE	G.KS.SE	Grade level.Knowledge and Skills.Student Expectation
NUMBER AND ALGEBRA		
SUB-STRAND: WHOLE NUMBERS		
1. Numbers up to 100		
1.1 counting to tell the number of objects in a given set	K.2.C	count a set of objects up to at least 20 and demonstrate that the last number said tells the number of objects in the set regardless of their arrangement or order;
	K.2.E	generate a set using concrete and pictorial models that represents a number that is more than, less than, and equal to a given number up to 20;
1.2 number notation, representations and place values (tens, ones)	K.2.E	generate a set using concrete and pictorial models that represents a number that is more than, less than, and equal to a given number up to 20;
	K.2.F	generate a number that is one more than or one less than another number up to at least 20;
	K.2.I	compose and decompose numbers up to 10 with objects and pictures.
	1.2.B	use concrete and pictorial models to compose and decompose numbers up to 120 in more than one way as so many hundreds, so many tens, and so many ones;
	1.2.C	use objects, pictures, and expanded and standard forms to represent numbers up to 120;
	1.2.D	use place value to compare whole numbers up to 120 using comparative language;
	2.2.E	locate the position of a given whole number on an open number line; and
	2.2.F	name the whole number that corresponds to a specific point on a number line.
	2.9.C	represent whole numbers as distances from any given location on a number line;
1.3 reading and writing numbers in numerals and in words	K.2.B	read, write, and represent whole numbers from 0 to at least 20 with and without objects or pictures;
	1.2.C	use objects, pictures, and expanded and standard forms to represent numbers up to 120;
1.4 comparing the number of objects in two or more sets	K.2.G	compare sets of objects up to at least 20 in each set using comparative language;
1.5 comparing and ordering numbers	K.2.H	use comparative language to describe two numbers up to 20 presented as written numerals; and
	1.2.E	use place value to compare whole numbers up to 120 using comparative language;
	1.2.F	order whole numbers up to 120 using place value and open number lines; and
	1.2.G	represent the comparison of two numbers to 100 using the symbols >, <, or =.
1.6 patterns in number sequences	K.2.A	count forward and backward to at least 20 with and without objects;
	K.5.A	recite numbers up to at least 100 by ones and tens beginning with any given number.
	1.5.A	recite numbers forward and backward from any given number between 1 and 120;
	1.5.B	skip count by twos, fives, and tens to determine the total number of objects up to 120 in a set;
	1.5.C	use relationships to determine the number that is 10 more and 10 less than a given number up to 120;
1.7 ordinal numbers (first, second, up to tenth) and symbols (1st, 2nd, 3rd, etc.)		

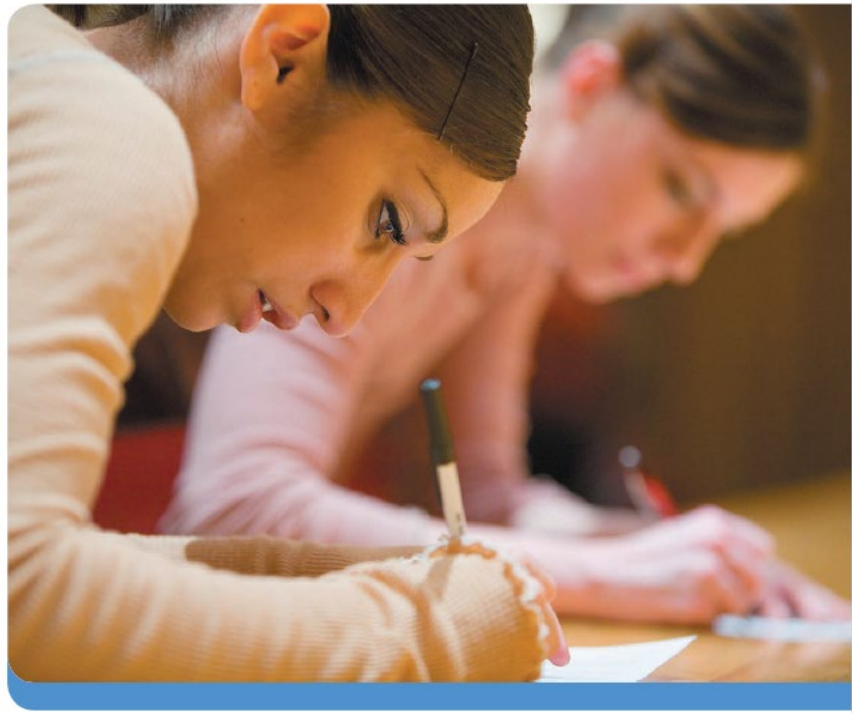
Texas Education Agency

College and Career Readiness Standards

Establishment of College and Career Readiness Standards

- Recognizing the importance of a world class education, the 79th Texas Legislature, Third Called Special Session, passed House Bill 1, the “Advancement of College Readiness in Curriculum” to increase the number of students who are college and career ready when they graduate high school.
- HB 1 required TEA and the Texas Higher Education Coordinating Board (THECB) to establish Vertical Teams to develop College and Career Readiness Standards (CCRS) in the areas of
  - English/language arts
  - mathematics
  - science
  - social studies
- These standards specify what students must know and be able to do to succeed in entry-level courses at postsecondary institutions in Texas.

Texas College and Career Readiness Standards



Texas Education Code, §28.008
Advancement of College Readiness in Curriculum

(a) To ensure that students are able to perform college-level course work at institutions of higher education, the commissioner of education and the commissioner of higher education shall establish vertical teams composed of public school educators and institution of higher education faculty.

(b) The vertical teams shall:

(1) recommend for approval by the commissioner of education and the Texas Higher Education Coordinating Board college readiness standards and expectations that address what students must know and be able to do to succeed in entry-level courses offered at institutions of higher education;

(2) evaluate whether the high school curriculum requirements under Section 28.002 and other instructional requirements serve to prepare students to successfully perform college-level course work;

(3) recommend how the public school curriculum requirements can be aligned with college readiness standards and expectations;

(4) develop instructional strategies for teaching courses to prepare students to successfully perform college-level course work; and

(5) develop or establish minimum standards for curricula, professional development materials, and online support materials in English language arts, mathematics, science, and social studies, designed for students who need additional assistance in preparing to successfully perform college-level course work.

(c) The commissioner of education and the Texas Higher Education Coordinating Board by rule shall establish the composition and duties of the vertical teams established under this section.

Texas Education Code, §28.008
Advancement of College Readiness in Curriculum

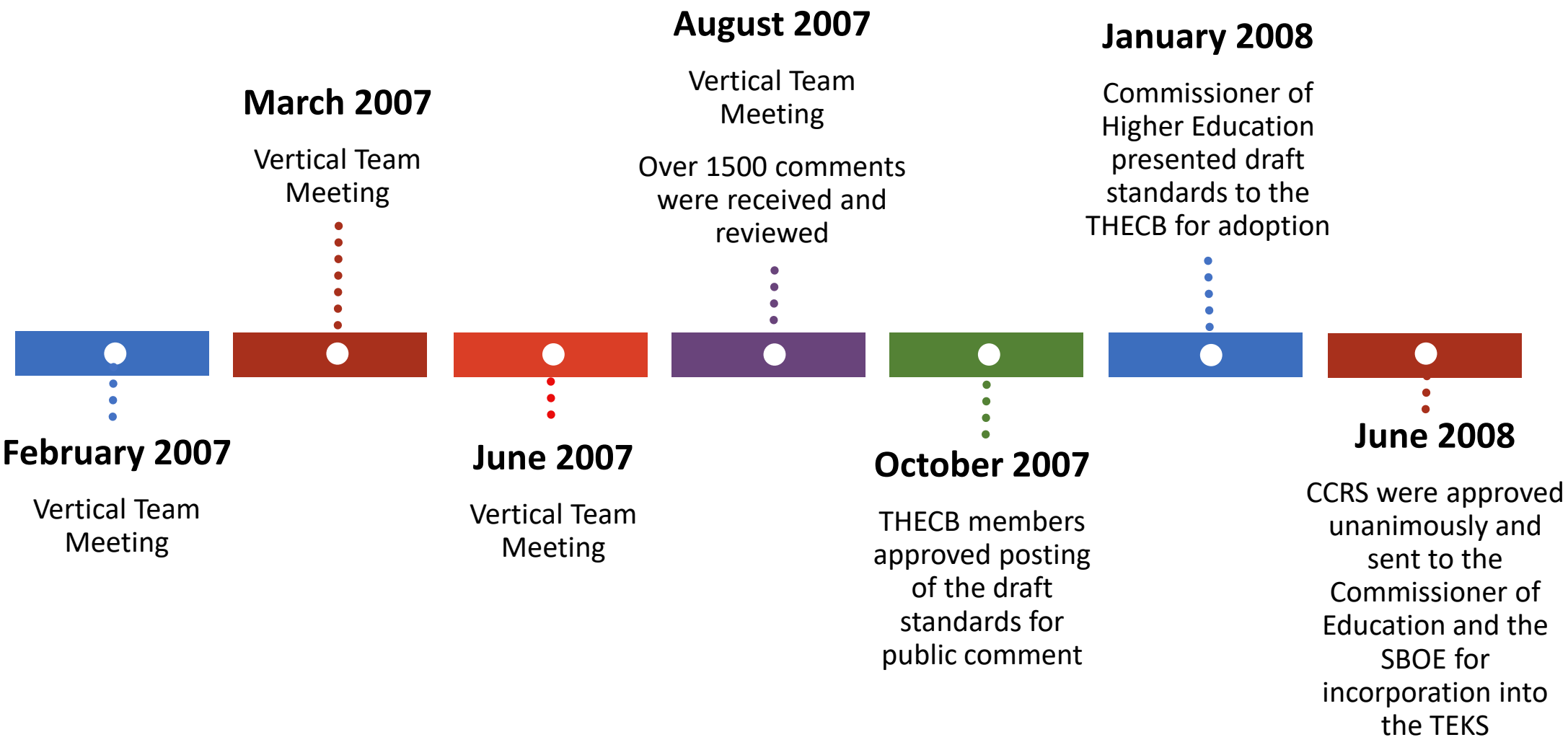
(d) The State Board of Education shall incorporate college readiness standards and expectations approved by the commissioner of education and the Texas Higher Education Coordinating Board under Subsection (b) into the essential knowledge and skills identified by the board under Section 28.002(c).

(e) Notwithstanding any other provision of this section, the State Board of Education retains its authority under Section 28.002 concerning the required curriculum.

(f) Not later than September 1, 2011, the vertical teams shall complete the development of or establish minimum standards for the curricula and related materials under Subsection (b)(5). The vertical teams shall develop or establish minimum standards for the English language arts curricula and materials first, followed by mathematics, science, and social studies, respectively. The vertical teams shall complete the development of or establish minimum standards for the English language arts curricula and materials for approval by the State Board of Education not later than June 1, 2009. The English language arts curricula and online materials must be made available to high school students beginning with the 2009 fall semester, with the mathematics, science, and social studies curricula and online materials respectively becoming available each subsequent fall semester. This subsection expires December 1, 2012.

(g) The agency shall coordinate with the Texas Higher Education Coordinating Board as necessary in administering this section.

Timeline


February 2007
Vertical Team Meeting
March 2007
Vertical Team Meeting
June 2007
Vertical Team Meeting
August 2007
Vertical Team Meeting
Over 1500 comments were received and reviewed
October 2007
THECB members approved posting of the draft standards for public comment
January 2008
Commissioner of Higher Education presented draft standards to the THECB for adoption
June 2008
CCRS were approved unanimously and sent to the Commissioner of Education and the SBOE for incorporation into the TEKS

The Nature of College and Career Readiness Standards

In developing the CCRS, the vertical teams set out to specify the knowledge and skills necessary to succeed in entry-level community college and university courses.

The CCRS

- were intended to serve a different purpose than high school graduation standards, which typically emphasize mastery of basic skills and knowledge, and not necessarily college and career readiness.
- distinguish themselves from high school standards by emphasizing content knowledge as a means to an end: the content stimulates students to engage in deeper levels of thinking.
- are designed to represent a full range of knowledge and skills that students need to succeed in entry-level college courses, as well as in a wide range of majors and careers.

The CCRS focus on “keystone” knowledge and skills, depend on students achieving facility and fluency in foundation knowledge in the disciplines, and assume that students have achieved mastery of the knowledge and skills delineated in the TEKS.

The final section of the CCRS contains cross-disciplinary, foundational cognitive skills that may be as important as any particular content knowledge. Some of these skills, such as problem solving, are also contained within specific subject areas, but they are given additional emphasis by their inclusion in the separate cross-disciplinary standards section

Organization of the College and Career Readiness Standards Framework

The CCRS consist of a multi-level framework that focuses not only on subject matter, but also on the way it is organized and presented in the classroom. This pedagogical understanding sets a threshold for the kinds of deeper investigation and learning that occur as students pursue in-depth courses in their chosen majors.

- Roman numerals mark the key content within each subject area.
- Capital letters specify the organizing components for introducing key knowledge and skills.
- Numbered headings delineate specific performance expectations regarding expected knowledge and skills and also suggest the challenge level of the standard.
- Lower-case letters present indicators of ways in which students would demonstrate performance in each area. These performance indicators, which are included as part of the appendix, serve as examples only and were not adopted as policy by the THECB.

I. Key Content:
Keystone ideas of a discipline that reverberate as themes throughout the curriculum. (Designated by Roman numerals.)

A. Organizing Components:
Knowledge and subject areas that organize a discipline around what students should retain, be able to transfer, and apply to new knowledge and skills. (Designated by capital letters.)

1. Performance Expectations:
Knowledge and skills that represent important ideas of the current understanding of each organizing concept as well as the multiple contexts in which each organizing concept can be manifest. (Designated by numbers.)

Mathematics as a Way of Knowing

Mathematics knowledge is essential to becoming a productive citizen in today's society. Many factors have increased the level of understanding of mathematics needed by the average adult. Our ever-changing world has become increasingly quantitative in nature. For example, in the physical sciences, social studies, and the business world, a widening array of phenomena is explained with numeric data presented visually in the form of charts and graphs that require interpretation. Mathematical reasoning is key to solving problems, formulating logical arguments, understanding quantitative features of various disciplines, critically analyzing media sources, and searching for patterns. Through mathematics, people become more able to make well-informed decisions by formulating conjectures and testing hypotheses. Mathematics cannot be viewed solely as a series of stand-alone courses or a set of specific skills. It must also be considered as a source of cross-disciplinary knowledge that is essential for success in numerous areas of study.

CCRS: Mathematics Standards

I. Numeric Reasoning

A. Number representation

1. Compare real numbers.
2. Define and give examples of complex numbers.

B. Number operations

1. Perform computations with real and complex numbers.

C. Number sense and number concepts

1. Use estimation to check for errors and reasonableness of solutions.

II.Algebraic Reasoning

A. Expressions and equations

1. Explain and differentiate between expressions and equations using words such as "solve," "evaluate," and "simplify."

B. Manipulating expressions

1. Recognize and use algebraic (field) properties, concepts, procedures, and algorithms to combine, transform, and evaluate expressions (e.g., polynomials, radicals, rational expressions).

C. Solving equations, inequalities, and systems of equations

1. Recognize and use algebraic (field) properties, concepts, procedures, and algorithms to solve equations, inequalities, and systems of linear equations.
2. Explain the difference between the solution set of an equation and the solution set of an inequality.

D. Representations

1. Interpret multiple representations of equations and relationships.
2. Translate among multiple representations of equations and relationships.

CCRS: Mathematics Standards

III. Geometric Reasoning

A. Figures and their properties

1. Identify and represent the features of plane and space figures.
2. Make, test, and use conjectures about one-, two-, and three-dimensional figures and their properties.
3. Recognize and apply right triangle relationships including basic trigonometry.

B. Transformations and symmetry

1. Identify and apply transformations to figures.
2. Identify the symmetries of a plane figure.
3. Use congruence transformations and dilations to investigate congruence, similarity, and symmetries of plane figures.

C. Connections between geometry and other mathematical content strands

1. Make connections between geometry and algebra.
2. Make connections between geometry, statistics, and probability.
3. Make connections between geometry and measurement.

D. Logic and reasoning in geometry

1. Make and validate geometric conjectures.
2. Understand that Euclidean geometry is an axiomatic system.

IV. Measurement Reasoning

A. Measurement involving physical and natural attributes

1. Select or use the appropriate type of unit for the attribute being measured.

B. Systems of measurement

1. Convert from one measurement system to another.
2. Convert within a single measurement system.

C. Measurement involving geometry and algebra

1. Find the perimeter and area of two-dimensional figures.
2. Determine the surface area and volume of three-dimensional figures.
3. Determine indirect measurements of figures using scale drawings, similar figures, the Pythagorean Theorem, and basic trigonometry.

D. Measurement involving statistics and probability

1. Compute and use measures of center and spread to describe data.
2. Apply probabilistic measures to practical situations to make an informed decision.

CCRS: Mathematics Standards

V. Probabilistic Reasoning

A. Counting principles

1. Determine the nature and the number of elements in a finite sample space.

B. Computation and interpretation of probabilities

1. Compute and interpret the probability of an event and its complement.
2. Compute and interpret the probability of conditional and compound events.

VI. Statistical Reasoning

A. Data collection

1. Plan a study.

B. Describe data

1. Determine types of data.
2. Select and apply appropriate visual representations of data.
3. Compute and describe summary statistics of data.
4. Describe patterns and departure from patterns in a set of data.

C. Read, analyze, interpret, and draw conclusions from data

1. Make predictions and draw inferences using summary statistics.
2. Analyze data sets using graphs and summary statistics.
3. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software.
4. Recognize reliability of statistical results.

CCRS: Mathematics Standards

VII. Functions

A. Recognition and representation of functions

1. Recognize whether a relation is a function.
2. Recognize and distinguish between different types of functions.

B. Analysis of functions

1. Understand and analyze features of a function.
2. Algebraically construct and analyze new functions.

C. Model real world situations with functions

1. Apply known function models.
2. Develop a function to model a situation.

VIII. Problem Solving and Reasoning

A. Mathematical problem solving

1. Analyze given information.
2. Formulate a plan or strategy.
3. Determine a solution.
4. Justify the solution.
5. Evaluate the problem-solving process.

B. Logical reasoning

1. Develop and evaluate convincing arguments.
2. Use various types of reasoning.

C. Real world problem solving

1. Formulate a solution to a real world situation based on the solution to a mathematical problem.
2. Use a function to model a real world situation.
3. Evaluate the problem-solving process.

CCRS: Mathematics Standards

IX. Communication and Representation

A. Language, terms, and symbols of mathematics

1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.
2. Use mathematical language to represent and communicate the mathematical concepts in a problem.
3. Use mathematics as a language for reasoning, problem solving, making connections, and generalizing.

B. Interpretation of mathematical work

1. Model and interpret mathematical ideas and concepts using multiple representations.
2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.

C. Presentation and representation of mathematical work

1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, graphs, and words.
2. Create and use representations to organize, record, and communicate mathematical ideas.
3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications.

X. Connections

A. Connections among the strands of mathematics

1. Connect and use multiple strands of mathematics in situations and problems.
2. Connect mathematics to the study of other disciplines.

B. Connections of mathematics to nature, real world situations, and everyday life

1. Use multiple representations to demonstrate links between mathematical and real-world situations.
2. Understand and use appropriate mathematical models in the natural, physical, and social sciences.
3. Know and understand the use of mathematics in a variety of careers and professions.

Example of Mathematics Performance Indicators

I. Numeric Reasoning

A. Number representation

1. Compare real numbers.

a. Classify numbers as natural, whole, integers, rational, irrational, real, imaginary, and/or complex.
b. Use and apply the relative magnitude of real numbers by using inequality symbols to compare them and locate them on a number line.
c. Order real numbers with and without a calculator using relationships involving decimals, rationals, exponents, and radicals.
d. Represent any rational number in scientific notation.

2. Define and give examples of complex numbers.

a. State the standard form used to represent complex numbers and describe their real and imaginary parts.
b. Represent i^n and square roots of negative numbers as complex numbers.
c. Understand that to solve certain problems and equations, number systems need to be extended from whole numbers to the set of all integers (positive, negative, zero), from integers to rational numbers, from rational numbers to real numbers (rational and irrational numbers), and from real numbers to complex numbers; define and give examples of each of these types of numbers.

§74.6. College and Career Readiness and Texas Essential Knowledge and Skills Alignment.

(a) In accordance with the Texas Education Code, §28.008, the State Board of Education shall incorporate College and Career Readiness Standards approved by the commissioner of education and the Texas Higher Education Coordinating Board into the essential knowledge and skills and indicate the alignment of the College and Career Readiness Standards with the essential knowledge and skills.

(b) The figure in this subsection identifies the alignment of the College and Career Readiness Standards for mathematics with the essential knowledge and skills. Figure: 19 TAC §74.6(b)

(c) The figure in this subsection identifies the alignment of the College and Career Readiness Standards for science with the essential knowledge and skills. Figure: 19 TAC §74.6(c)

(d) The figure in this subsection identifies the alignment of the College and Career Readiness Standards for social studies with the essential knowledge and skills. Figure: 19 TAC §74.6(d)

(e) The figure in this subsection identifies the alignment of the College and Career Readiness Standards for cross-disciplinary studies with the essential knowledge and skills. Figure: 19 TAC §74.6(e)

(f) The figure in this subsection identifies the alignment of the College and Career Readiness Standards for English language arts with the essential knowledge and skills. Figure: 19 TAC §74.6(f)

Mathematics Alignment

Texas Education Agency

Mathematics

CCRS	Foundation		Enrichment	
	Math	Science	CTE	Technology Applications
I. Numeric Reasoning				
A. Number representations and operations				
I.A.1. Compare relative magnitudes of rational and irrational numbers and understand that numbers can be represented in different ways.	Kindergarten: (2)(A), (2)(C), (2)(E)-(H) Grade 1: (2)(D)-(G), (5)(A), (5)(C) Grade 2: (2)(C)-(F), (3)(B), (7)(B), (9)(B)-(C) Grade 3: (2)(B)-(D), (3)(F)-(H) Grade 4: (2)(A), (2)(C), (2)(F)-(H), (3)(D), (3)(G) Grade 5: (2)(B), (4)(A) Grade 6: (2)(B), (2)(D), (5)(C), (5)(F) Grade 8: (2)(D), (12)(D) Advanced Quantitative Reasoning: (2)(A)	Grade 8: (8)(B)-(C) Astronomy: (6)(A)-(D), (9)(A)-(B), (10)(A), (11)(E) Chemistry: (5)(C) Earth and Space Science: (5)(E)-(F), (15)(C) Integrated Physics and Chemistry: (4)(C)-(D), (4)(F), (5)(F), (6)(C), (7)(B)-(C) Physics: (4)(A)-(D), (5)(B)-(C), (7)(B)-(E), (8)(B)-(C)	Accounting II: (4)(H); Engineering Mathematics: (9)(D), (11)(E); Financial Mathematics: (3)(K), (4)(K), (7)(I), (8)(C)-(D); Mathematical Applications in Agriculture, Food, and Natural Resources: (5)(A); Mathematics for Medical Professionals: (6)(A)-(B); Principles of Technology: (4)(E), (12)(D); Engineering Science: (12)(E); Biotechnology II: (4)(G); Scientific Research and Design: (4)(G); Securities and Investments: (4)(A-E); Banking and Financial Services: (9)(B); Accounting I: (10)(C)(E), (11)(C-E), Financial Analysis: (5)(B)-(C),(6)(B); Welding II: (3)(E)	Robotics Programming and Design: (5)(E), (7)(R)
I.A.2. Perform computations with rational and irrational numbers.	Kindergarten: (2)(I), (3)(A)-(C) Grade 1: (3)(A)-(F), (4)(C), (5)(B), (5)(F)-(G) Grade 2: (2)(A)-(B), (4)(A)-(D), (7)(A), (7)(C), (5)(A), (10)(C), (11)(A) Grade 3: (2)(A), (3)(D), (4)(A)-(K), (5)(B), (5)(D), (6)(C)-(D), (7)(B)-(C), (8)(B) Grade 4: (3)(A), (3)(E)-(F), (4)(A)-(F), (4)(H), (5)(D), (7)(E), (8)(B)-(C), (10)(B) Grade 5: (2)(A), (3)(B)-(L), (4)(B), (4)(E), (4)(G), (6)(B), (7), (10)(F), Grade 6: (3)(A)-(B), (3)(D)-(E), (3)(H), (5)(B), (7)(A), (8)(D), (9)(B), (13)(C), (14)(C) Grade 7: (3)(A)-(B), (4)(B)-(E), (5)(C), (6)(B)-(I), (9)(A)-(D), (11)(A)-(C), (13)(A)-(B), (13)(D)-(E) Geometry: (2)(A), (13)(A) Mathematical Models with Applications: (8)(A) Algebra II: (7)(A) Advanced Quantitative Reasoning: (2)(E) Precalculus: (5)(C), (5)(E) Statistics: (6)(C)-(D) Algebraic Reasoning: (2)(D), (5)(A)-(E)	Grade 6: (6)(B), (8)(C) Grade 8: (6)(A) Chemistry: (6)(C), (8)(B)-(E), (9)(A), (10)(C)-(D), (10)(H), (11)(C)-(D) Integrated Physics and Chemistry: (4)(A), (4)(D), Physics: (2)(J), (3)(E), (4)(A)-(D), (5)(B)-(C), (5)(F), (6)(A)-(D), (7)(B), (7)(E), (8)(C)-(D) Aquatic Science: (2)(I), (4)(B-C), (5)(A), (6)(B), (7)(A), (8)(A), (11)(A), (12(A) Astronomy: (7)(B), (8)(B), (9)(C), (11)(C) Earth and Space Science: (2)(H), (5)(B), (7)(B), (10)(D) Environmental Systems: (2)(J), (7)(B)	Accounting II: (1)(B), (1)(E), (3)(C)-(D), (3)(F), (3)(I), (4)(C)-(G), (4)(I), (5)(B), (5)(D)-(F), (5)(I), (5)(K)-(P), (6)(D)(i)-(iii), (6)(E)(iii), (6)(E)(v)-(vi), (6)(G)(iii)-(iv), (6)(H), (6)(K)(i)-(iii), (6)(K)(vi)-(vii); Applied Mathematics for Technical Professionals: (2)(A), (2)(D), (2)(F)-(H), (3)(B)-(H), (4)(A), (4)(E)-(F), (5)(A)-(B), (5)(D), (6)(B); Digital Electronics: (7)(A); Entrepreneurship: (8)(C); Forestry and Woodland Ecosystems: (4)(A); Advanced Marketing: (16)(A), (16)(C), (20)(A); Basic Collision Repair and Refinishing: (3)(C); Collision Repair: (2)(D), (5)(D), (10)(K)-(M); Paint and Refinishing: (3)(C); Engineering Mathematics: (3)(A)-(D), (4)(A)-(L), (5)(A)-(B), (6)(A), (6)(C)-(D), (6)(G), (6)(I)-(L), (6)(N), (7)(A)-(B), (7)(G)-(I), (8)(A), (8)(D), (8)(G)-(H), (8)(L)-(S), (9)(A), (9)(D)-(F), (10)(A)-(D), (10)(F)-(H), (10)(J), (10)(M)-(N), (11)(B), (11)(D), (11)(F); Financial Mathematics: (3)(C), (3)(F), (3)(H)-(I), (4)(A)-(C), (4)(F)-(I), (5)(C)-(D), (6)(B), (7)(A)-(B), (7)(D), (7)(F)-(G), (8)(A)-(D), (8)(F), (9)(A)-(B), (10)(A)-(C), (10)(F), (11)(A)-(D), (12), (14), (15)(A), (17)(C), (17)(G); Manufacturing Engineering Technology II: (8)(B); Mathematical Applications in Agriculture, Food, and Natural Resources: (4)(A)-(F), (5)(F), (6)(A)-(B), (7)(A)-(C), (8)(A)-(B), (9)(A)-(B), (10)(A)-(B), (11)(A)-(C), (12)(A)-(C), (12)(E); Mathematics for Medical Professionals: (3)(A), (3)(C), (4)(D)-(F), (5)(C), (6)(F)-(G), (7)(A)-(D) ; Robotics II: (7)(A), (7)(C)-(D), (7)(G)-(I), (8)(E), (8)(G), (9)(B); Statistics and Business Decision Making: (10)(A), (11)(B), (12)-(14), (15)(A), (16)(D), (16)(F), (18)-(19), (20)(B)-(C), (21); Principles of Technology: (8)(B), (9)(B)-(C), (9)(G), (10)(B)-(C), (12)(C); Robotic II: (7)(H)-(I); Engineering Science: (7)(D), (7)(F), (8)(B)-(D), (9)(G), (10)(A), (10)(D), (10)(G)-(J), (11)(B), (12)(D), (14)(C), (14)(E)-(F), (15)(A)-(H), (16)(A)-(D); Biotechnology I: (3)(F), (11)(C); Biotechnology II: (14)(C); Diversified Manufacturing II: (9)(A); Metal Fabrication and Machining II: (3)(C), (8)(A); Introduction to Welding: (5)(A), (5)(E)-(F); Welding I: (3)(B), (3)(G)-(I); Welding II: (3)(A); Small Engine Technology I: (5)(D), (6)(A)(C)-(E); Small Engine Technology II: (5)(C), (7)(A)(E)-(G); Automotive Basics: (3)(C); Automotive Technology I: Maintenance and Light Repair: (2)(C); Aircraft Airframe Technology: (5)(A), (5)(F); Aircraft Powerplant Technology: (5)(B), (7)(D);	Discrete Mathematics for Computer Science: (2)(D), (4)(L)-(N), (6)(B), (6)(H)-(K), (6)(M) Robotics Programming and Design: (5)(B), (7)(I), (7)(L)-(M), (7)(R)
B. Number sense and number concepts				
I.B.1. Use estimation to check for errors and reasonableness of solutions.	Kindergarten - Grade 12: (1)(B)-(C) Grade 2: (9)(E) Grade 3: (4)(B) Grade 4: (2)(D), (3)(F), (4)(G) Grade 5: (3)(A), (8)(A) Grade 8: (2)(B) Algebra I: (3)(G) Algebra II: (3)(D), (3)(G), (4)(G), (5)(E), (6)(J) Advanced Quantitative Reasoning: (2)(A), (2)(H) Statistics: (6)(H), (6)(J), (7)(C), (7)(E)-(F) Algebraic Reasoning: (7)(C)		Accounting II: (2)(B)-(C); Applied Mathematics for Technical Professionals: (1)(B)-(C), (2)(D), (5)(F); Digital Electronics: (2)(B)-(C); Engineering Mathematics: (2)(B)-(C), (6)(H), (11)(A), (11)(E)-(F); Financial Mathematics: (2)(B)-(C), (10)(B)-(C); Mathematical Applications in Agriculture, Food, and Natural Resources: (2)(B)-(C); Mathematics for Medical Professionals: (2)(B)-(C), (3)(E); Statistics and Business Decision Making: (2)(B)-(C); Practicum in Marketing: (6)(E); Principles of Technology: (3H); Engineering Design and Presentation I: (8)(B); Engineering Design and Presentation II: (8)(B); Engineering Design and Problem Solving: (3)(F), (5)(I), (11)(A)-(F); Engineering Science: (3)(F); Biotechnology I: (3)(F); Biotechnology II: (3)(F); Scientific Research and Design: (3)(F); Metal Fabrication and Machining II: (3)(C); Metal Fabrication and Machining II: (8)(A); Introduction to Welding: (5)(A); Welding I: (3)(B); Welding II: (3)(A), (3)(G); Dollars and Sense: (3)(C), (3)(L)	Robotics Programming and Design: (1)(B)-(C)
I.B.2. Interpret the relationships between the different representations of numbers.	Kindergarten: (2)(A), (2)(C)-(D), (2)(I) Grade 1: (2)(A)-(C) Grade 2: (2)(A), (2)(B), (2)(E)-(F), (3)(A), (3)(C)-(D), Grade 3: (2)(A)-(B), (3)(A)-(G) Grade 4: (2)(A)-(B), (2)(E), (2)(G)-(H), (3)(A)-(C), (3)(G) Grade 5: (2)(A), (4)(F) Grade 6: (7)(A) Grade 8:(2)(C) Algebra: (11)(A)	Grades 1&2: (4)(A) Grade 3-5: (4) Astronomy: (6)(A-E) Biology: (12)(C) Earth and Space Systems: (2)(H)	Applied Mathematics for Technical Professionals: (2)E)-(F), (2)(D), (5)(F); Mathematics for Medical Professionals: (3)(D), 3(F)	

Texas Education Agency

Appendix

CCRS Mathematics Vertical Team

Linda Gann, Co-Chair	Northside Independent School District
Selina Vasquez-Mireles, Co-Chair	Texas State University - San Marcos
Thomas R. Butts	University of Texas at Dallas
Troy Furlough	DCCCD, El Centro College
Kenneth Grantham	Dallas Independent School District
Doug Hale	University of Texas - Permian Basin
Shary Horn	Alvin Independent School District
Lucy Hernandez Michal	El Paso Community College
Diane Reed	Ysleta Independent School District
Linda Zientek	Blinn College, Brenham Campus Sam Houston State University