College Readiness Mathematics Vertical Team Phase 2
GAP ANALYSIS

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Background/Process:

Phase 2 of the College Readiness Program has been completed as directed by the Third Special Called Session of the 79th Texas Legislature with House Bill 1, which is Section 28.008 of Texas Education Code: "Advancement of College Readiness in Curriculum." A vertical team (VT) of ten members, six representing secondary public education and four representing higher education, was charged with evaluating the degree of alignment between the state's College Readiness Standards (CRS, adopted January 24, 2008) for Mathematics and the Texas Essential Knowledge and Skills (TEKS) for secondary mathematics (i.e., grades 6-8, Algebra I, Geometry, Mathematical Models with Applications, Algebra II, Pre-Calculus) and to identify any gaps that may exist. This process is called "gap analysis" and the two documents that the VT was charged with comparing are readily available on the Internet at: http://www.thecb.state.tx.us/collegereadiness/TCRS.cfm and http://www.tea.state.tx.us/rules/tac/chapter111/index.html.

Pre-meeting homework was emailed to all team members on July 10, 2008, instructing members to review the CRS and TEKS and rate each of the CRS items as having strong, average, or weak alignment with the TEKS (and these would be specified). The ranking system of "strong, average, weak" was referred to with the acronym "SAW." It was clarified at the in-person meeting that "average" was intended as a synonym for "moderate" rather than some type of norm-reference idea. In general, the SAW system was used to assess the qualitative degree of strength of the most direct connection between CRS and TEKS, rather than a quantitative count of how many connections of any strength were found. For cases of alignment that were difficult to identify, members were also asked to note if this was due to the nature of the CRS or to the nature of the TEKS. The ten-member Phase 2 team was instructed that the CRS could not be changed, but that the TEKS could be revised to incorporate the CRS wherever gaps were found between the two documents.

On July 23-24, 2008 in Austin, Texas, the Phase 2 College Readiness Mathematics Vertical Team held an in-person meeting to begin discussion of the gap analyses team members completed as individuals prior to this meeting. Joseph Kulhanek, TEA Director of the College Readiness Program, and Lynette Heckmann, Director of College Readiness Initiatives from the Higher Education Coordinating Board, guided the VT with their task of analyzing and aligning the CRS Mathematics Key Contents, Organizing Components, and Performance Expectations to the secondary mathematics TEKS. An overview of Phase 1 was provided with ample time for additional questions from team members. Norma Torres-Martinez, Director of Mathematics for the Texas Education Agency, provided an overview of the most recent math TEKS adoption process,

explained the legislative intent to incorporate the CRS into the TEKS, and made those present aware of resources such as the Texas Math Initiative (http://www.tea.state.tx.us/math/).

Ms. Torres-Martinez then introduced and explained the role of the six-member Math TEKS writing team that was also present during our two-day Vertical Team meeting. The role of the six-member Math TEKS writing team was not to identify gaps but to listen actively to the VT discussion and ask clarifying questions as necessary. It helped that one of the Phase 2 VT members had also served on the Phase 1 team which wrote the CRS. She offered clarification on the intent of the CRS to help the team make a more meaningful assessment of alignment between CRS and TEKS. Periodically, team members discussed when to focus only on the TEKS itself and when to consider what was known about accompanying examples and training materials as well.

Ms. Torres-Martinez facilitated the collective VT discussion using the SAW scale, addressing the ten CRS standards individually, in order. The template was pre-populated in the left-hand column with the CRS. The middle column was used to record the VT's SAW alignment rating and their comments. The right-hand column was used to record the specific parts of the TEKS the VT members found that align with the CRS. While some of this collective feedback was simply "called out" and recorded by TEA staff, items where there was no strong consensus yielded on-the-spot discussion to identify and resolve issues. The VT finished this task in the middle of the second day, a few hours earlier than scheduled. The VT then broke up into small groups to identify which of the TEKS from the right-hand column of the spreadsheet showed strong alignment to the CRS. TEKS noted in boldface font were deemed to align strongly with the CRS, whereas TEKS noted in regular font were deemed to have a less direct alignment with the CRS.

A first draft of this gap analysis report was prepared by the co-chairs on July 27, 2008 and then emailed to the other eight VT members on July 31, 2008. All VT members had the opportunity to relay to the co-chairs any feedback or corrections either via email or during a conference call held on August 4, 2008. Taking into account the discussion and feedback from this stage, the co-chairs finalized the report and submitted it to the agency for posting on the web portal. Before the documents were finalized, VT team members had one further opportunity to email their approval or disapproval.

Findings and Contextual Comments for Gap Analysis Spreadsheet:

The Phase 2 College Readiness Mathematics vertical team members found that the College Readiness Standards in mathematics are well-aligned with the Texas Essential Knowledge and Skills for Secondary Mathematics. With minor exceptions, team members generally indicated strong alignment between the CRS and TEKS.

The following are the findings and comments for each individual CRS Standard:

Numeric Reasoning (CRS Mathematics Standard I) found to be aligned with Secondary Mathematics TEKS

- Numeric Reasoning strand was determined as an embedded expectation throughout secondary mathematics student expectations as evidenced by problems placed on the state TAKS exam.
- Some Phase 2 members suggested "include irrational numbers" in TEKS 8.1.A or state as "real numbers" to increase alignment strength between CRS I.A.1 and the TEKS.
- The team found the CRS to have stronger clarity of student expectations regarding complex numbers. For students to obtain mastery at the intended rigor of the TEKS (i.e., 2A.6A or 2A.8B) involving complex numbers, students would have to understand the specific CRS I.A.2 and I.B.1 expectations. The group suggested a possible clarifying change to include the recommended specificity. Inclusion of this recommendation would create a strongly aligned Numeric Reasoning. It was noted that neither the CRS nor the TEKS specify expressions involving absolute value.

Algebraic Reasoning (CRS Mathematics Standard II) found to be strongly aligned with Secondary Mathematics TEKS

- CRS II.A. Expressions and equations and II.D. Representations had three performance expectations that received a strong alignment rating from all ten VT members.
- CRS II.B. Manipulating expressions and II.C. Solving equations, inequalities, and systems of equations were found as embedded throughout Algebra II and Pre-Calculus following mastery in prior mathematical studies.
- CRS II.B.1 indicates "polynomials, radicals, rational expressions," which are not at an equivalent level of specificity in the TEKS. The manipulation of expressions at the Algebra II and Pre-Calculus levels are assumed knowledge and skills to achieve mastery of the stated TEKS. This student expectation indicates to transform expression to equivalent form, and this may need to be clarified with additional specificity.
- CRS II.C.1 and 2 performance expectations were unclear as to whether the equations or inequalities involved radicals, absolute values, polynomials or are restricted to linear only. Therefore, these performance expectations had an implied understanding throughout Pre-Calculus with evidence of alignment in Algebra I and II.
- Although CRS II.D.1 performance expectation received strong alignment reviews, the group discussed the openness of interpretation of the CRS. Were the equations

restricted to linear only or were open to rational or conics? The TEKS had greater specificity as noted in the chart.

Geometric Reasoning (CRS Mathematics Standard III) found to be strongly aligned with Secondary Mathematics TEKS

- CRS III.A. Figures and their properties, III.B. Transformations and symmetry, III.C. Connections between geometry and other mathematical content strands, and III.D. Logic and reasoning in geometry. All but one of these performance indicators received strong alignment ratings from 10 VT members.
- CRS III.C.2 Make connections between geometry, statistics, and probability performance indicator earned 6 strong and 4 average alignment votes from the ten VT members. Some members of the group suggested clarification or explicit connection between geometry and probability. This may be accomplished in Phase 3 using professional development and instructional materials.
- The phrase "composite figures" (G.8.A) was noted as not used universally by all authors.

Measurement Reasoning (CRS Mathematics Standard IV) found to be strongly aligned with Secondary Mathematics TEKS

- Four of the eight CRS Measurement Reasoning performance expectations received strong alignment ratings from all ten members of the VT. The other four received average alignment ratings.
- CRS IV.A.1 performance expectation was viewed as embedded in TEKS but a suggestion was made to change or add clarification in the Algebra I TEKS A.6 or A.7. A plausible suggestion was to adjust A.6 to be: *The student understands the meaning of the slope and intercepts of the graphs of linear functions and zeros of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations "**using appropriate units within and between measurement systems**."* This would also incorporate a stronger alignment with CRS IV.B.1 and 2.
- CRS IV.A.1: a note was made regarding this expectation as an integral part of Science student expectations and an opportunity for collaboration in Phase 3 between mathematics and science.
- CRS IV.B.1 performance expectation aligns with a Grade 8 Math TEKS and Pre-Calculus TEKS. The Phase 2 members commented on a need for alignment to ensure student support between mathematics and science when simultaneous studies incorporate the conversion from one measurement system to another.
- CRS IV.B.2 performance expectation begins implicitly in elementary grades. The group suggested a modification to clarify this expectation within the TEKS 7.4A by changing the language "involving unit conversions" to "involving unit conversions within a single measurement system."
- CRS IV.D.1 performance expectation would have a stronger alignment if TEKS 8.12A student expectation would change "range" to "variability (range and interquartile range, IQR)." Not only is the concept of "variability" more appropriate than one specific measure (range) in this sentence, but the overall change is also consistent with student expectations involving the features of boxplots in Grade 8 mathematics.

- IV.D.2 performance expectation use of "probabilistic measures" was unclear to Phase 2 members. It was explained that the CRS use of "probabilities measures" was intended to mean "determine a probability involving measurement (e.g., data or areas that are measured)." A suggestion was made to incorporate clarification within the professional development and instructional materials of Phase 3.

Probabilistic Reasoning (CRS Mathematics Standard V) found to be aligned with Secondary Mathematics TEKS

- The Phase 2 group determined a difference in vocabulary usage between the CRS and TEKS following discussion of differences in academic vocabulary usage between textbooks and between instructors (e.g., "composite experiments")
- Mathematical Modeling with Applications (MMA) TEKS include specific probability models (e.g., binomial and geometric) which go beyond the CRS expectations.
- TEKS 7.10.A "simple or composite experiments" was suggested to already have additional teacher support with currently available professional development and instructional resources.

Statistical Reasoning (CRS Mathematics Standard VI) found to be strongly aligned with Secondary Mathematics TEKS

- All nine of the CRS student expectations received a majority rating of strongly aligned with specific references to the Secondary Mathematics TEKS.
- The Phase 2 group had concerns regarding the clarity of intent with the CRS student expectations. VI.B.1, what was meant by the word "types [of data]?" For example, Phase 2 members made the recommendation to edit MMA.3.A to include "qualitative versus quantitative" data to align more strongly with CRS VI.B.1, and to make explicit the expectation that students need to know what kind of data calls for a bar graph and what kind of data calls for a histogram.
- When using the word "reliability," the Phase 2 group also had concerns regarding the clarity of intent with the CRS student expectations in VI.C.4. After hearing the explanation of the intent of the CRS, the VT member with advanced statistics education expertise noted that it was being used in the CRS to mean "validity," which is a different formal concept in statistics, and one that is indeed present in the TEKS.

Functions (CRS Mathematics Standard VII) found to be strongly aligned with Secondary Mathematics TEKS

- Three of the six CRS performance expectations received strong alignment evaluations from all ten Phase 2 members, with the other three receiving average alignment. The analysis determined TEKS student expectations that referred to functions are consistently embedded throughout the Secondary Mathematics TEKS.
- The Phase 2 group had concerns regarding the intent of certain words used in the CRS. VII.A.1 "relation," VII.A.2 "types," and VII.B.1 "features."

Problem Solving and Reasoning (CRS Mathematics Standard VIII) found to be strongly aligned with Secondary Mathematics TEKS

- All ten of the CRS performance expectations received strong alignment ratings from at least eight of the 10 Phase 2 members. The group determined that problem solving and reasoning are embedded throughout all secondary mathematics courses as indicated in the TEKS.

Communication and Representation (CRS Mathematics Standard IX) found to be strongly aligned with Secondary Mathematics TEKS

The CRS Communication and Representation and Secondary Mathematics TEKS were found to be strongly aligned.

- Each of the CRS performance expectations received strong alignment ratings from at least eight of the ten Phase 2 members. The group determined that communication and representation are embedded throughout all secondary mathematics courses as indicated in the TEKS.

Connections (CRS Mathematics Standard X) found to be strongly aligned with Secondary Mathematics TEKS

- All five of the CRS performance expectations received strong alignment ratings from eight or more of the ten Phase 2 members. The group determined that connections are an integral component of secondary mathematics courses as indicated in the TEKS.

Phase 2 Vertical Team members

Higher Education:
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Secondary Education:
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Linda Gann [Phase 2 VT Co-chair], Northside ISD, San Antonio
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Texas Education Agency

Norma Torres-Martinez, Director of Mathematics
Erika Pierce, Assistant Director of Mathematics
Joseph Kulhanek, Director of the College Readiness Program

Texas Higher Education Coordinating Board

Lynette Heckman, Director of College Readiness Initiatives
Evelyn Hiatt, Deputy Assistant Commissioner of P16 Initiatives

Further Comments:

Although analyses of the Cross-Disciplinary Standards were not an assigned task or charge, Phase 2 members were unable to assess the alignment, particularly with the technology standards. Are there ample opportunities to ensure proper integration of technology, such as graphing calculators, spreadsheets, and other types of technology, well-established in our secondary mathematics TEKS? At what depth and rigor will these expectations be established and assessed?

College Readiness Mathematics Vertical Team Phase 3 will need to make certain teachers understand the rigor and intent of the standards through professional development and instructional materials.

Mathematics Gap Analysis

Organizing Structure: The Texas College Readiness Standards Compared to the Texas Essential Knowledge and Skills for Mathematics

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
The Mathematics College Readiness Standards (CRS) are designed to help students understand the specific content knowledge and academic skills necessary for college readiness. The CRS are broad in nature, equipping students for general education college mathematics courses, but are not intended to encompass all skills necessary for students entering majors that require specific mathematical knowledge.	SAW System: S = Strong Alignment A = Average Alignment W = Weak Alignment For example: S9, A1 = Nine of the ten vertical team members rated the item as having strong alignment and one as average.	As stipulated in the Texas Education Code, school districts are required to provide instruction in essential knowledge and skills at the appropriate grade levels. The mathematics TEKS listed within this column apply to the essential mathematical knowledge for middle and high school students.
I. Numeric Reasoning		
A. Number representation		
1. Compare real numbers.	S8, A2; Irrational numbers are not compared	**6.1ab**cde, **7.1ab**cde, **8.1a**b**cd**e, 2A.2b, A.BU(a)(1), G.BU(a)(1), 2A.BU(a)(1)
2. Define and give examples of complex numbers.	S2, A7, W1; Do we need specificity in TEKS (add to: 2a6c, "roots(real and complex)")	**2A.2b, 2A.6c, 2A.8b,** P.1d
B. Number operations		
1. Perform computations with real and complex numbers.	S5, A5; Operations with complex numbers implicit (add to: 2a6c, "roots(real and complex)")	**6.2abce, 7.2bdef, 8.2a**b, A.4, A.11a, **2A.2, 2A.6c,** M.7a, M.1abc, M.5ab, M6
C. Number sense and number concepts		

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
1. Use estimation to check for errors and reasonableness of solutions.	S10; Implied throughout the high school math courses	**6.2d, 6.8a**, **6.11b**, **7.2c, 7.9ac, 7.13b , 8.2c, 8.14b**c, A.2b, **A.7c, A.8c**, A.BU(a)(5), 2A.BU(a)(5)
II. Algebraic Reasoning		
A. Expressions and equations		
1. Explain and differentiate between expressions and equations using words such as “solve”, “evaluate”, and “simplify”.	S10	**8.5b, A.4ab, A.4, 2A.2a**
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).	S7, A3; Embedded throughout algebra 2 and precal	**8.2b, 8.5b, 8.16b, A.4ab**, **2A.2**, 2A.3ab
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.	S8, A2; Embedded throughout algebra 2 and precal	**7.5a,** 8.3b, A.**4a**b, A.**7b**, A.**8b, 2A.3ab**
2. Explain the difference between the solution set of an equation and the solution set of an inequality.	S3, A7; Implied throughout precal	A.7c, A.8c, 2A.3abc
D. Representations		
1. Interpret multiple representations of equations and relationships.	S10	**6.10a**, 6.12a, **7.5a, 7.11a,** 7.14a, **8.5, 8.12c,** 8.15a, **A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
2. Translate among multiple representations of equations and relationships.	S10	6.10a, 6.12a, **7.5a,** 7.14a, **8.4**, 8.5, 8.14c, 8.15a, A.BU(a)(6), **A.1d**, **A.2c** , A.5c,G.BU(a)(6), 2A.BU(a)(6), **2A.3b, 2A.6b, 2A.8c, 2A.9b, 2A.10d, 2A.11d, G.BU(a)(6), P.2b**
III. Geometric Reasoning		
A. Figures and their properties		
1. Identify and represent the features of plane and space figures.	S10	**6.6abc, 7.6abcd, 7.8abc, 8.6b, 8.7a**bc**, G.4, G.5b, G.6, G.7a, G.9d, 2A.5a,** P.5, M.8, **M.9**
2. Make, test, and use conjectures about one-, two-, and three-dimensional figures and their properties.	S10	(6.13, 7.15, 8.16: the conjectures can be made using geometric patterns and figures; conjectures are implied in modeling and conics); 6.6, 6.7, **6.8a, 7.6d,** 7.8c, **7.15a,** 8.7b, **8.10, G.2, G.9abc**d
3. Recognize and apply right triangle relationships including basic trigonometry.	S10	7.6b, **8.7c, 8.9a, G.5d, G.8c, G.11c,** P.1**, P.3abe, M.8b**
B. Transformations and symmetry		
1. Identify and apply transformations to figures.	S10; Much of this is implicit in elementary grades	**7.7b, 8.6ab, A.6c, A.9bc**d**, 2A.4b, 2A.7**a**b, 2A.9a, 2A.10a, 2A.11b, G.2b, G.5c, G.10a, G.11a**bc**, P.2a, P.6, M.9ab**
2. Identify the symmetries of a plane figure.	S10; Much of this is implicit in elementary grades	**7.7b,** 7.8c, **8.6,** 8.7b, **2A.5c, G.10a, P.1c, M.9b**
3. Use congruence transformations and dilations to investigate congruence, similarity, and symmetries of plane figures.	S10	7.7b, 7.8c**, 8.6,** 8.7b**,** 2A.5c, **G.10a,** P.1c, M.9a
C. Connections between geometry and other mathematical content strands		
1. Make connections between geometry and algebra.	S10	**6.4b,** 6.7**, 7.4abc,** 7.7a, MS.I(2), 8.1, 8.7cd, A.BU(a)(5), A.5c, A.6ad, A.10b, **2A.4, 2A.5, G.5ab, G.7bc,** G.8, G.11, **M.8a**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
2. Make connections between geometry, statistics, and probability.	S6, A4; Make probability expectations explicit	6.9, **6.10a, 7.11a,** 8.11c, **8.12c,** A.2d, G.BU(a)(4), 2A.1b, P.3c, M.2d, M.4b
3. Make connections between geometry and measurement.	S10	**6.8bc, 7.9ac, 8.8abc, 8.9ab, 8.10ab, G.8abd,** G.10ab, **G.11d, P.3e,** P.5, **P.6b**
D. Logic and reasoning in geometry		
1. Make and validate geometric conjectures.	S10	6.6c, **6.13a, 7.15a, 8.16a,** A.6c, A.9bc, **G.1, G.2ab, G.3, G.9, G.10a, G.11a**
2. Understand that Euclidean geometry is an axiomatic system.	S10	**G.1abc, G.3**
IV. Measurement Reasoning		
A. Measurement involving physical and natural attributes		
1. Select or use the appropriate type of unit for the attribute being measured.	S8, A2; Embedded in curriculum; suggested location for change or clarification occur in a6 or a7. This is also a Science student expectation.	**6.8bd,** 7.9a, 8.8, A.BU(a)(1)
B. Systems of measurement		
1. Convert from one measurement system to another.	S8, A2; We should have student expectations at the same time as math and science studies; suggested location for change or clarification occur in g11bd, g8 or in algebra TEKS.	**8.2d,** P.3e
2. Convert within a single measurement system.	S10; Much of this is implicit in elementary grades; modify 7.4a "involving unit conversions within; (Within a single measurement system)	6.4a, **6.8d,** 7.4a, 8.10ab
C. Measurement involving geometry and algebra		

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
1. Find the perimeter and area of two-dimensional figures.	S10	6.4a, **6.8b**, 7.4a, **7.9a**, 8.7c, 8.8a, 8.9b, G.BU(a)(3), G.7c, **G.8,** G.11d
2. Determine the surface area and volume of three-dimensional figures.	S10	**6.8b,** 7.8b, **7.9bc, 8.8abc**, A.BU(a)(3), **2A.BU(a)(4), G.8d**, G.11d
3. Determine indirect measurements of figures using scale drawings, similar figures, Pythagorean Theorem, and basic trigonometry.	S10	**7.3b, 8.6a, 8.7c, 8.9ab,** 8.10ab, **G.5d, G.7c, G.8c,** G.10b, **G.11, P.3**
D. Measurement involving statistics and probability		
1. Compute and use measures of center and spread to describe data.	S8, A2	**6.10b, 7.12ab, 8.12a,** A.2d, 2A.1b, **M.2b**d, M3
2. Apply probabilistic measures to practical situations to make an informed decision.	S6, A4; Probabilistic measures means determine probability from a context involving measurement data.	6.10ad, M.2a, **M.3c, M.4b**
V. Probabilistic Reasoning		
A. Counting principles		
1. Determine the nature and the number of elements in a finite sample space.	S6, A4	**6.9a, 7.10a**, M.4ab
B. Computation and interpretation of probabilities		
1. Compute and interpret the probability of an event and its complement.	S8, A2	**6.9b**, 7.10b, 8.11ab, M.4
2. Compute and interpret the probability of conditional and compound events.	S3, A5, W2	7.10a, **8.11a**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
VI. Statistical Reasoning		
A. Data collection		
1. Plan a study.	S8, A2	**6.I(a)(2), 6.10ad, 6.11b, 7.I(a)(2), 7.11ab, 7.13b, 8.I(a)(2)**, 8.12bc, 8.13a, **8.14b,** A.BU(a)(5), A.2d, 2A.BU(a)(5), M.3a,
B. Describe data		
1. Determine types of data.	S6, A2, W2; Add "types" of data (quantitative vs. qualitative) in m3a	**6.10a**bd, **7.11a, 8.12a,**
2. Select and apply appropriate visual representations of data.	S10	**6.10**ab**c, 7.11a, 8.12ac**, 8.4, P.3c , M.2ad, M.3b
3. Compute and describe summary statistics of data.	S9, A1	**6.10b, 7.12ab,** 8.12a, M.2b, M.3ab
4. Describe patterns and departure from patterns in a set of data.	S8, A2	6.10, 6.11c, 8.12bc, 8.13ab, 8.16a, A.11c, 2A.9a, **M.2,** M.3c
C. Read, analyze, interpret, and draw conclusions from data		
1. Make predictions and draw inferences using summary statistics.	S9, A1	6.10b, **7.11b,** 8.12b, **8.13a**, A.1be, A.2d, 2A.1b, M.2, M.3c
2. Analyze data sets using graphs and summary statistics.	S10	6.10acd, **7.11a**, **7.12**, **8.12a**b**c**, A.2d, 2A.1b, P.3c, **M.2ab**cd**,** M.3c
3. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software.	S8, A2	6.10a, **6.11d**,7.11a, **7.13d**, 8.12bc, **8.14d,** A.2d, **P.3c, M.2**ab**d, M.8a**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
4. Recognize reliability of statistical results.	S7, A2, W1; One member was concerned about the intent of the word reliability. The CRS use of the word reliability is consistent with a statistician's use of the word validity. After clarity was provided regarding the CRS intent, this member was OK with the alignment.	8.13ab, 8.14d, 8.16b, M.1c, M.2bc, **M.3c**
VII. Functions		
A. Recognition and representation of functions		
1. Recognize whether a relation is a function.	S7, A2, W1	**A.BU(a)(3),** A.1, A.2, **A.5ac**, 2A.1, P.1
2. Recognize and distinguish between different types of functions.	S8, A2; "Type" was interpreted to mean "family" of functions.	**A.2a, 2A.4a, P.1abcde, P.2a**
B. Analysis of functions		
1. Understand and analyze features of a function.	S9, A1	**A.5c, A.6, A.9, A.10b, A.11bc, 2A.1a,** 2A.2b, **2A.7abc, 2A.9a, P.1abcde,** M.2d
2. Algebraically construct and analyze new functions.	S10	**A.3b,** A.5c, **2A.4bc**, **2A.9a, 2A.10a, P.1, P.2a**
C. Model real world situations with functions		
1. Apply known function models.	S10	**A.BU(a)(5),** A.5, A.6, A.9, **A.11a,** 2A.4a, **2A.9f, 2A.10b, 2A.11f,** P.2a, **P.3, M.5a, M.8c**
2. Develop a function to model a situation.	S10	**A.BU(a)(5), A.1bcd,** A.3, A.6a, **A.7a, 2A.1b,** 2A.3a, **2A.8a, 2A.10f, P.I(a)(1), P.3bd, M.2d**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
VIII. Problem Solving and Reasoning		
A. Mathematical problem solving		
1. Analyze given information.	S9, A1; Embedded in all courses	**6.11b, 7.13b, 8.14bcd, A.BU(a)(3), G.BU(a)(3), 2A.BU(a)(3), A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)**
2. Formulate a plan or strategy.	S9, A1; Embedded in all courses	**6.11b, 7.13b, 8.14bcd**, A.BU(a)(3), G.BU(a)(3), 2A.BU(a)(3), A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)
3. Determine a solution.	S9, A1; Embedded in all courses	**6.11b, 7.13b, 8.14b**cd, A.BU(a)(3), G.BU(a)(3), 2A.BU(a)(3), A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)
4. Justify the solution.	S9, A1; Embedded in all courses	**6.11b, 7.13b, 8.14b**cd, A.BU(a)(3), G.BU(a)(3), 2A.BU(a)(3), A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)
5. Evaluate the problem-solving process.	S9, A1; Embedded in all courses	6.11b, 7.13b, 8.14bcd, A.BU(a)(3), G.BU(a)(3), 2A.BU(a)(3), A.BU(a)(6), G.BU(a)(6), 2A.BU(a)(6)
B. Logical reasoning		
1. Develop and evaluate convincing arguments.	S8, A2	**6.13b, 7.15b, 8.16b,** G.BU(a)(6), **G.3bc**e, **G.5,** G.8, G.9, G.10, G.11
2. Use various types of reasoning.	S10	6.11b, 7.13b, 8.14bcd, A.2d, **G.3cde,** G.5b, G.7c, G.8, **G.9, G.10,** G.11, all BU(a)(3), all BU(a)(6)
C. Real world problem solving		
1. Formulate a solution to a real world situation based on the solution to a mathematical problem.	S8, A2	**6.11a, 7.13a, 8.14a, G.5cd, M.1ac, M.2c** d, M.3a

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
2. Use a function to model a real world situation.	S10	**A.BU(a)(5), A.5, A.6, A.9,** A.11a, 2A.4a, 2A.9f, 2A.10b, **2A.11f,** P.2a, **P.3, M.5a, M.8c**
3. Evaluate the problem-solving process.	S10; Embedded in all courses	6.11b, 7.13b, 8.14bcd, all BU(a)(3), all BU(a)(6)
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.	S10	**6.4a, 6.5a, 7.4c,** 8.I(a)(3), **8.1d, A.BU(a)(2),** A.BU(a)(6), **A.3a, A2.BU(a)(2),** A2.BU(a)(6)
2. Use mathematical language to represent and communicate the mathematical concepts in a problem.	S10	**6.I(3), 6.12a, 7.I(3), 7.14a, 8.I(3), 8.15a, A.BU(a)(6),** A.6b, **2A.BU(a)(6), G.BU(a)(6), P.I(2)**
3. Use mathematics as a language for reasoning, problem solving, making connections, and generalizing.	S10; Embedded in HS geometry	**6.I(3), 6.12a, 7.I(3), 7.14a, 8.I(3), 8.15a, A.BU(a)(6),** A.3a**, A.5c, A.6b, A.BU(a)(2), 2A.6b, G.BU(a)(6), G.1a**, **G.6a, P.I(2),** M.1c, **M.3b**
B. Interpretation of mathematical work		
1. Model and interpret mathematical ideas and concepts using multiple representations.	S10	**6.10a, 6.12a, 7.11a, 7.14a, 8.12c, A.BU(a)(5), A.1d, A.5c, A.6a, A.8b, A.11b, 2A.BU(a)(5),** 2A.1b, **2A.6b, G.BU(a)(5), M.2a, M.1b,** P.1
2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.	S10	6.10a, **6.12a, 7.11a, 7.14a, 8.12c, 8.15a,** A.BU(a)(5), A.BU(a)(6), **A.1d, A.5c,** A.6a, A.8a, A.11b, 2A.BU(a)(5), 2A.BU(a)(6)**, 2A.1b, 2A.6b,** G.BU(a)(5), G.BU(a)(6), P.1 , M.1b, **M.2a**
C. Presentation and representation of mathematical work		
1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, graphs, and words.	S10	A.BU(a)(5), **A.BU(a)(6), A.1d, A.5c, A.6a,** A.8ab**, A.11b,** 2A.BU(a)(5), **2A.BU(a)(6), 2A.1b, 2A.6b,** G.BU(a)(5, 6), G.9abcd, P.1, M.1b, M.2ad, **M.3bc**

Texas College Readiness Mathematics Standards	Alignment Rating with Comment	Texas Essential Knowledge and Skills for Mathematics (TEKS)
2. Create and use representations to organize, record, and communicate mathematical ideas.	S10	**6.4ab, 6.10ab, 6.12b, 7.14b, 8.15b, A.BU(a)(5), 2A.BU(a)(5), 2A.BU(a)(6), G.BU(a)(5), G.BU(a)(6),** P.I(2), **M.3b**
3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications.	S10	**6.12a,** 6.12b, 7.11b, **7.12b, 7.14a,** 7.14b, **8.12b, 8.15a,** 8.15b, **A.BU(6), 2A.BU(6), G.BU(6), P.I(2), M.I(2), M.1c,** M.3b
X. Connections		
A. Connections among the strands of mathematics		
1. Connect and use multiple strands of mathematics in situations and problems.	S10	6.I(2), 6.4b, 6.7, **6.8bc,** 6.9, **6.10a,** 7.I(2), **7.4ab, 7.7a, 7.9ac,** 7.11a, 8.I(2), **8.7cd, 8.8abc, 8.9ab, 8.10ab, 8.12c, A.BU(a)(5), A.2d, A.5c, A.6ad, A.10b, 2A.1b, 2A.4, 2A.5, G.BU(a)(4),** G.5ab, G.7bc, **G.8b, G.10a, G.11, P.1,** P.3c, **P.3e, P.5,** M.2d, M.3bc, M.4b, M.8A
2. Connect mathematics to the study of other disciplines.	S10	**6.11a, 7.13a, 8.14a, A.BU(6), 2A.BU(6), G.BU(4), G.BU(6), P.3e, M.5, M.6, M.7, M.8, M.9**
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.	S10	**6.10a, 6.11a, 7.11a, 7.13a, 8.12c, 8.14a,** G.5cd, **P.3c, P.3e, P.4b, P.6b, M.1a**bc**, M.2c, M.2d, M.3a**
2. Understand and use appropriate mathematical models in the natural, physical, and social sciences.	S10	P.3e, **P.4b, P.5abc, P.5d, P.6b,** M.1b, **M.7abc, M.8abc, M.9ab**
3. Know and understand the use of mathematics in a variety of careers and professions.	S8, A2	**6.11a, 7.13a, 8.15a,** M.5c, M.6, M.8a, M.7, M.9ab,