TSIA2
Mathematics
Test Specifications
(Version 1.4)

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Change log (v1.1):

- Updated NRS EFL descriptor labels

Change log (v1.2)

- Updated categorical score labels
- Updated second-chance path to college readiness classification

Change log (v1.3)

- Revisions to address feedback from the THECB, including changes to terminology, updates to tables, and clarifications to routing flow

Change log (v1.4)

- Revisions to address line edits from the THECB

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Introduction and test purpose

The Texas Success Initiative Assessment 2 (TSIA2) is a revision of the TSIA ("TSIA1") designed, developed, and maintained by the College Board on the ACCUPLACER® platform. In 2012, the College Board entered into a contract with the Texas Higher Education Coordinating Board (THECB) to create and support TSIA, with the goal of improving student success rates in Texas colleges. In 2019, the College Board was awarded a contract to create an updated version of TSIA ("TSIA2") to serve that goal going forward.

This document briefly describes the mathematics portions of TSIA2 and includes revision design goals, overviews of the tests, and supporting tables and figures.

TSIA2 Mathematics revision design goals

The TSIA2 test revision is intended to accomplish the following goals:

- Creating integrated classification and diagnostic testing so that test takers move seamlessly through the suite of assessments in a single experience and so that test takers who are placed in the not college ready category don't end testing without receiving actionable feedback
- Shifting from the two classification scores and three scoring categories of TSIA1 (college ready, developmental education, adult basic education [ABE]) to a single college readiness classification score and two scoring categories (college ready, not college ready)
- Reducing the number of constraints on item selection relative to TSIA1, allowing the TSIA2 adaptive testing engine to perform more flexibly and efficiently
- Continuing to provide diagnostic test takers with actionable information about academic strengths and weaknesses across a range of content categories
- Integrating TSIA1's standalone ABE testing components into TSIA2 diagnostic testing, providing a sufficient span of item difficulty in the new diagnostic tests to cover the range previously addressed by separate TSIA1 diagnostic and ABE testing (i.e., six levels of National Reporting System for Adult Education [NRS] Educational Functioning Level Descriptors [EFLD]) and addressing the performance expectations outlined in the Texas Adult Education and Literacy (AEL) Content Standards 2.0
- Calibrating the new diagnostic test to the same ability scale (theta) as the CRC Test
- Documenting, confirming, and, where necessary, improving alignment with current Texas academic and adult education literacy standards, specifically (1) Texas College and Career Readiness Standards (2018), (2) Texas Essential Knowledge and Skills (TEKS), Algebra II, (3) AEL Content Standards 2.0, and (4) NRS EFL Descriptors

Overview of TSIA2 Mathematics suite

Suite overview

The TSIA2 Mathematics suite consists of

- a multiple-choice college readiness classification (CRC) test, providing information regarding test takers' college readiness in mathematics; and
- a multiple-choice Diagnostic Test, providing information regarding test takers' academic strengths and weaknesses in mathematics.

Test takers move in a seamless fashion between the CRC and Diagnostic Tests, based on the routing framework (see "Scores, routing, and testing outcomes," below). Test takers must complete all required testing before any information on their performance is yielded.

The CRC Test includes mathematics-focused components, as did TSIA1, but unlike its predecessor the CRC is delivered to test takers as a singular testing experience.

The TSIA2 Diagnostic Test subsumes the separate TSIA1 DE Diagnostic and ABE tests, encompassing the same range of item difficulty as the prior two tests and yielding the same range of classifications.

The TSIA2 tests are computer delivered. The multiple-choice CRC and Diagnostic Tests are adaptive, meaning that test takers are routed through subsequent items based on their performance on preceding items. A range of accommodated versions is available for students with documented disabilities that may prevent them from taking the computer-delivered assessments; tests in these accommodated formats are fixed form linear tests (i.e., not adaptive).

Scores, routing, and testing outcomes

Scores

The TSIA2 mathematics suite has the following scores, routing paths, and testing outcomes.

CRC. The multiple-choice CRC Test yields a score from 910 to 990. The test has a single college readiness classification score, established by a standard-setting process, and two scoring categories: college ready and not college ready.

Important: While CRC Test takers' scores fall into either a college ready or not college ready range, test takers do not receive a college ready or not college ready designation based solely on CRC performance. The final determination, as the discussion in "Routing" and "Testing outcomes," below, makes clear, is made in conjunction with performance data from the Diagnostic Test. Indeed, test takers must complete all routed testing to receive any information regarding their performance.

Diagnostic. The multiple-choice Diagnostic Test yields the following information:

(1) A classification into one of five diagnostic levels closely aligned to the NRS EFL. For guidance regarding the NRS EFL and the relation of the NRS EFL to the TSIA2 diagnostic levels, the following can be used:

a. Level 2: Beginning basic (subsumes Level 1: Beginning literacy, for reporting purposes)
b. Level 3: Low intermediate
c. Level 4: Middle intermediate
d. Level 5: High intermediate
e. Level 6: Adult secondary

(2) A proficiency descriptor (basic, proficient, or advanced) that identifies the test taker's relative academic strengths and weaknesses in four content strands:

a. Quantitative Reasoning
b. Algebraic Reasoning
c. Geometric and Spatial Reasoning
d. Probabilistic and Statistical Reasoning

Each proficiency descriptor is accompanied by statements describing typical student performance in the content strand for the given descriptor.

Routing

Within tests. Within the computer-delivered multiple-choice CRC and Diagnostic Tests, test takers are adaptively routed. (Accommodated versions of these are fixed-form linear tests.)

Between tests. The following section narrates the TSIA2 mathematics suite routing framework. The same information is represented visually in Figure 1. Routing flow on page 14.

(1) CRC Test

All test takers are administered the CRC Test first.

a. If the CRC Test yields a score in the college ready range (i.e., a score at or above the college readiness classification score), mathematics testing is concluded.
b. If the CRC Test yields a score in the not college ready range (i.e., a score below the college readiness classification score), then test takers are routed to the Diagnostic Test.

(2) Diagnostic Test

Test takers are routed to the Diagnostic Test if their CRC Test yields a score in the not college ready range. Test takers then experience one of two scenarios.

a. If performance on the Diagnostic Test yields a diagnostic level of 6, then their testing experience ends and these test takers receive an ISR indicating they have demonstrated college readiness.
b. If performance on the Diagnostic Test yields a diagnostic level of 5 or lower, then test takers have not demonstrated college readiness on the Diagnostic Test. These test takers receive an individual score report (ISR) indicating that they have not demonstrated college readiness.

Testing outcomes

Following testing, test takers who have completed all tests to which they are routed receive an individual score report (ISR) generally showing either a **college ready** classification or a **diagnostic** profile.

(1) College ready classification

Test takers receive a college ready classification in one of two ways:

a. Test takers who score in the college ready range on the CRC Test are classified as college ready.
b. Test takers who score in the not college ready range on the CRC Test but receive a diagnostic level of 6 on the Diagnostic Test are classified as college ready.

(2) Diagnostic profile

a. Test takers who score in the not college ready range on the CRC Test and receive a diagnostic level of 5 or lower based on the Diagnostic Test receive a diagnostic profile as part of their ISR.

As noted in "Scores," above, the diagnostic profile includes a diagnostic level and four proficiency descriptors along with proficiency statements accompanying the descriptors.

Test descriptions

Mathematics College Readiness Classification (CRC) Test

Purpose

The CRC Test is designed primarily to ascertain whether test takers are college ready or not college ready with respect to mathematics.

Overall claim for the test

Students can demonstrate college readiness proficiency in mathematics.

Delivery platforms

In its standard form, the CRC Test is delivered adaptively via computer. A range of accommodated versions is available for test takers with documented disabilities that may prevent them from taking the computer-delivered assessments; tests in these formats are fixed form (i.e., not adaptive).

Item format

All CRC items are multiple-choice and discrete.

Item content

Test items cover four main categories, which are divided into subcategories.

- Quantitative Reasoning
  - Compare magnitudes of rational and irrational numbers
  - Solve problems with ratios, proportions, and percents
  - Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy)
  - Identify, manipulate, and interpret linear equations, inequalities, and expressions

- Algebraic Reasoning
  - Solve linear equations, inequalities, and systems of linear equations
  - Evaluate linear functions
  - Solve quadratic and exponential relationship problems in context (e.g., exponential decay/growth, compound interest, and depreciation)
  - Identify and manipulate quadratic, polynomial, exponential, rational, and radical equations and expressions
  - Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)

- Geometric and Spatial Reasoning
  - Convert units within systems of measurement
  - Find perimeter, area, surface area and volume using a variety of methods, including estimation
  - Use transformations to investigate congruence, similarity, and symmetry
  - Apply right triangle relationships and basic trigonometry
  - Make connections between geometry and algebraic equations

- Probabilistic and Statistical Reasoning
  - Compute and interpret probability
  - Compute and describe measures of center and spread of data
  - Classify data and construct appropriate representations of data
  - Analyze, interpret, and draw conclusions from data

A fuller articulation of item content can be found in Table 1 and Table 2 in Appendix: Tables and figures, beginning on page 8.

Testing experience

A single testing experience consists of 20 items:

6 items – Quantitative Reasoning
7 items – Algebraic Reasoning
3 items – Geometric and Spatial Reasoning
4 items – Probabilistic and Statistical Reasoning

Mathematics Diagnostic Test

Purpose

The Diagnostic Test is designed primarily to identify test takers' academic strengths and weaknesses with respect to mathematics.

Delivery platforms

In its standard form, the Diagnostic Test is delivered adaptively via computer. A range of accommodated versions is available for test takers with documented disabilities that may prevent them from taking the computer-delivered assessments; tests in these formats are fixed-form linear (i.e., not adaptive).

Item format

All Diagnostic items are multiple-choice and discrete.

Item content

Paralleling the CRC Test, the Diagnostic Test comprises items in four content categories, which are divided into subcategories. An asterisk (*) below denotes content on the Diagnostic Test not found on the CRC Test.

- Quantitative Reasoning
  - Perform basic math operations with whole numbers and integers, decimals, and fractions*
  - Round numbers to a given decimal place*
  - Compare numbers in a variety of forms, including decimals, fractions, and percents*
  - Compare magnitudes of rational and irrational numbers
  - Solve problems with ratios, proportions, and percents
  - Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy)
  - Identify, manipulate, and interpret linear equations, inequalities, and expressions
- Algebraic Reasoning
  - Solve linear equations, inequalities, and systems of linear equations
  - Evaluate linear functions
  - Solve quadratic and exponential relationship problems in context (e.g., exponential decay/growth, compound interest, and depreciation)
  - Identify and manipulate quadratic, polynomial, exponential, rational, and

radical equations and expressions
    - Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)

- Geometric and Spatial Reasoning
    - Identify common units of measurement*
    - Identify and define types of angles*
    - Convert units within systems of measurement
    - Find perimeter, area, surface area and volume using a variety of methods, including estimation
    - Use transformations to investigate congruence, similarity, and symmetry
    - Apply right triangle relationships and basic trigonometry
    - Make connections between geometry and algebraic equations

- Probabilistic and Statistical Reasoning
    - Sort and count data*
    - Construct simple graphs and tables*
    - Compute and interpret probability
    - Compute and describe measures of center and spread of data
    - Classify data and construct appropriate representations of data
    - Analyze, interpret, and draw conclusions from data

A fuller articulation of item content can be found in Table 1 in Appendix: Tables and figures, beginning on page 8.

Testing experience

A single testing experience consists of 48 items, 12 items per strand, across the four strands.

Appendix: Tables and figures

Table 1. Mathematics multiple-choice item content (CRC and diagnostic)

Content category	Content subcategory	Description
Quantitative Reasoning		
(Diagnostic only)	Perform basic math operations with whole numbers and integers, decimals, and fractions.	The student will use mathematical symbols to represent words that represent those symbols, and add, subtract, multiply, and divide whole numbers, decimals, and fractions.
(Diagnostic only)	Round numbers to a given decimal place	The student will round to a specified place value, including 10, 100, and 1,000.
(Diagnostic only)	Compare numbers in a variety of forms, including decimals, fractions, and percents	The student will compare and order whole numbers, decimals, and fractions (including on a number line).
	Compare magnitudes of rational and irrational numbers	The student will apply math operations to rational and irrational numbers.
	Solve problems with ratios, proportions, and percents	The student will apply ratios, proportions, and percents to solve problems.
	Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy)	The student will formulate a solution to a real-world situation based on the solution to a mathematical problem.
	Identify, manipulate, and interpret linear equations, inequalities, and expressions	The student will recognize and use algebraic properties, concepts, procedures, and algorithms to combine, transform, evaluate, and interpret expressions and equations.
Algebraic Reasoning		
	Solve linear equations, inequalities, and systems of linear equations	The student will recognize and use algebraic properties, concepts, procedures, and algorithms to solve equations, inequalities, and systems of linear equations, as well as make connections among graphical, tabular, and algebraic representations.

	Evaluate linear functions	The student will evaluate a linear function for a particular value.
	Solve quadratic and exponential relationship problems in context (e.g., exponential decay/growth, compound interest, and depreciation)	The student will formulate a solution to a real-world situation based on the solution to a mathematical problem.
	Identify and manipulate quadratic, polynomial, exponential, rational, and radical equations and expressions	The student will recognize and use algebraic properties, concepts, procedures, and algorithms to combine, transform, and evaluate expressions and equations.
	Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)	The student will recognize and use algebraic properties, concepts, procedures, and algorithms to solve equations and evaluate functions, as well as make connections among graphical, tabular, and algebraic representations.
Geometric and Spatial Reasoning		
(Diagnostic only)	Identify common units of measurement	The student will identify length, area, volume, time, and temperature as standard measurements.
(Diagnostic only)	Identify and define types of angles	The student will identify and define angles including supplementary, complementary, and vertical angles.
	Convert units within systems of measurement	The student will use proportional reasoning to convert units of measurement.
	Find perimeter, area, surface area, and volume using a variety of methods, including estimation	The student will recognize, identify, and validate properties of two- and three-dimensional figures, as well as calculate perimeter, area, surface area, and volume of figures.
	Use transformations to investigate congruence, similarity, and symmetry	The student will identify and apply transformations to figures.
	Apply right triangle relationships and basic trigonometry	The student will apply right angle relationships and use basic trigonometric ratios to solve problems.
	Make connections between geometry and algebraic equations	The student will make connections between geometry and algebra.

Probabilistic and Statistical Reasoning		
(Diagnostic only)	Sort and count data	The student will sort and count data.
(Diagnostic only)	Construct simple graphs and tables	The student will construct simple graphs and tables to represent data.
	Compute and interpret probability	The student will compute and interpret the probability of an event and its complement.
	Compute and describe measures of center and spread of data	The student will compute and describe summary statistics of data.
	Classify data and construct appropriate representations of data	The student will identify appropriate representations of data based on its type.
	Analyze, interpret, and draw conclusions from data	The student will determine types of data, analyze given information, and determine a solution.

Table 2. TSIA1 to TSIA2 crosswalk

Note: This table illustrates the content relationship between the two testing suites. It further shows that while TSIA2's content organization and item pools have been updated, all content in TSIA1 continues to be assessed in TSIA2.

Elements Tested in TSIA1	Corresponding Elements in TSIA2
Elementary Algebra and Functions	**Quantitative Reasoning**
Linear equations, inequalities, and systems	Solve problems with ratios, proportions, and percents
Algebraic expressions and equations (other than linear)	Compare magnitudes of rational and irrational numbers Identify, manipulate, and interpret linear equations, inequalities, and expressions
Word problems and applications	Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy)
Elementary Algebra and Functions	**Algebraic Reasoning**
Linear equations, inequalities, and systems	Solve linear equations, inequalities, and systems of linear equations Evaluate linear functions
Intermediate Algebra and Functions	**Algebraic Reasoning**
Quadratic and other polynomial expressions, equations, and functions	Identify and manipulate quadratic, polynomial, exponential, rational, and radical equations and expressions Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)
Expressions, equations, functions involving powers, roots, and radicals	Identify and manipulate quadratic, polynomial, exponential, rational, and radical equations and expressions Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)
Rational and exponential expressions, equations, and functions	Identify and manipulate quadratic, polynomial, exponential, rational, and radical equations and expressions Solve equations and evaluate functions (e.g., quadratic, polynomial, exponential, rational, and radical)
Word problems and applications	Solve quadratic and exponential relationship problems in context (e.g., exponential decay/growth, compound interest, and depreciation)

Geometry and Measurement	**Geometric and Spatial Reasoning**
Plane geometry	Make connections between geometry and algebraic equations
Transformations and symmetry	Use transformations to investigate congruence, similarity, and symmetry
Measurement (linear, area, and three-dimensional)	Convert units within systems of measurement Find perimeter, area, surface area, and volume using a variety of methods, including estimation
Modeling and applications	Find perimeter, area, surface area, and volume using a variety of methods, including estimation Apply right triangle relationships and basic trigonometry
Data Analysis, Statistics, and Probability	**Probabilistic and Statistical Reasoning**
Interpreting categorical and quantitative data	Classify data and construct appropriate representations of data Analyze, interpret, and draw conclusions from data
Statistical measures	Compute and describe measures of center and spread of data
Probabilistic reasoning	Compute and interpret probability
Mathematics (ABE)	*Mathematics (Diagnostic)*
Number Sense	**Quantitative Reasoning**
Recognize and compare numbers	Compare numbers in a variety of forms
Mathematical symbols	Perform basic math operations with whole numbers and integers, decimals, and fractions
Application of math operations	Perform basic math operations with whole numbers and integers, decimals, and fractions
Currency	Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy)
Rounding and estimation	Round numbers to a given place value
Patterns, Functions, and Algebra	**Quantitative Reasoning or Algebraic Reasoning**
Number line and grid	Perform basic math operations with whole numbers and integers, decimals, and fractions
Use ratios, proportions, and percents	Solve problems with ratios, proportions, and percents
Order of operations and linear equations	Perform basic math operations with whole numbers and integers, decimals, and fractions Solve linear equations, inequalities, and systems of linear equations
Patterns and sequences	Solve proportional relationship problems in context (e.g., linear relationships in financial literacy and numeracy) Identify and manipulate linear equations, inequalities, and expressions

Statistics and Probability	**Probabilistic and Statistical Reasoning**
Probabilities	Compute and interpret probability
Graphs and charts	Sort and count data Construct simple graphs and tables
Averages	Analyze, interpret, and draw conclusions from data
Geometry and Measurement	**Geometric and Spatial Reasoning**
Measurements	Identify common units of measurement Convert units within systems of measurement
Areas, perimeters, and angles	Identify and define types of angles Find perimeter, area, surface area, and volume using a variety of methods, including estimation

Figure 1. Routing flow