TSIA2
Mathematics
Test Specifications
(Version 1.2)

Prepared for THECB
by the College Board
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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

Contents

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 placement 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-based strands
- 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
- Documenting, confirming, and, where necessary, improving alignment with current Texas academic and ABE literacy standards, specifically (1) Texas CCRS College Readiness Standards and Performance Expectations (2018), (2) Texas Essential Knowledge and Skills (TEKS), Algebra II, (3) State of Texas Assessments of Academic Readiness (STAAR) Algebra II End-of-Course Assessments, as used as an option in Texas public high schools to determine college readiness, (4) AEL Content Standards 2.0, and (5) 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 classifications," 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 accommodations 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 classifications

Scores

The TSIA2 mathematics suite has the following scores, scoring categories, and routing paths.

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. Test takers whose performance on the mathematics test falls in the not college ready category are routed to mathematics diagnostic testing.

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

(1) A classification into one of five NRS EFLD levels:

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 categorical score (basic, proficient, or advanced) that identifies the student'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

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 college ready score, mathematics testing is concluded.
b. If the CRC Test yields a not college ready score (i.e., a score below the cut score), 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 not college ready score. They then experience one of two outcomes.

a. If the Diagnostic Test yields an NRS EFL of 6, then their testing experience ends with a college readiness classification.
b. If the Diagnostic Test yields an NRS EFL of 5 or lower, then their testing experience ends with a diagnostic classification.

Classifications

Following testing, test takers receive either a **college ready** classification or a **diagnostic** classification.

(1) College ready

Test takers receive a college ready classification if their CRC Test yields a college ready score or receive an NRS EFLD level of 6 based on diagnostic testing.

(2) Diagnostic

Test takers receive a diagnostic classification if their CRC Test yields a not college ready score and an NRS EFLD level of 5 or lower based on diagnostic testing.

As noted in "Scores," above, the diagnostic classification includes an NRS EFL and content strand scores.

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 accommodations 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
  - Use quantitative reasoning to compare magnitudes of rational and irrational numbers
  - Use quantitative reasoning to solve problems with ratios, proportions, and percents
  - Use quantitative reasoning to solve 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
    - Use quantitative reasoning to solve 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
    - Use quantitative reasoning to 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
    - Use quantitative reasoning to compute and interpret probability
    - Use quantitative reasoning to 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 accommodations 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, Diagnostic Test items cover four content strands, which are divided into subcategories.

- 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
    - Use quantitative reasoning to compare magnitudes of rational and irrational numbers
    - Use quantitative reasoning to solve problems with ratios, proportions, and percents
    - Use quantitative reasoning to solve 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
    - Use quantitative reasoning to solve 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
    - Use quantitative reasoning to 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
    - Use quantitative reasoning to compute and interpret probability
    - Use quantitative reasoning to 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 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).
	Use quantitative reasoning to compare magnitudes of rational and irrational numbers	The student will apply math operations to rational and irrational numbers.
	Use quantitative reasoning to solve problems with ratios, proportions, and percents	The student will apply ratios, proportions, and percents to solve problems.
	Use quantitative reasoning to solve 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.
	Use quantitative reasoning to solve 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.
	Use quantitative reasoning to 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.
	Use quantitative reasoning to compute and interpret probability	The student will compute and interpret the probability of an event and its complement.
	Use quantitative reasoning to 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: All TSIA1 content is represented in TSIA2, and no new content has been introduced to TSIA2. However, content has been moved and/or renamed relative to TSIA1. The following table illustrates the content relationship between the two testing suites.

TSIA1 content category	**TSIA2 content category**
Mathematics (Placement)	*Mathematics (CRC)*
Elementary Algebra and Functions	**Quantitative Reasoning**
Linear equations, inequalities, and systems	Use quantitative reasoning to solve problems with ratios, proportions, and percents
Algebraic expressions and equations (other than linear)	Use quantitative reasoning to compare magnitudes of rational and irrational numbers Identify, manipulate, and interpret linear equations, inequalities, and expressions
Word problems and applications	Use quantitative reasoning in solving 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 Use quantitative reasoning in solving equations and evaluating functions (e.g., quadratic, polynomial, exponential, rational, and radical)
Word problems and applications	Solve 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)	Use quantitative reasoning to 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	Use quantitative reasoning to compute and describe measures of center and spread of data
Probabilistic reasoning	Use quantitative reasoning to 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	Use quantitative reasoning to solve 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	Use quantitative reasoning to 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	Use quantitative reasoning to solve 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	Use quantitative reasoning to 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 Use quantitative reasoning to 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