

TNReady High School Integrated Mathematics

2017–18 School Year

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This document provides information about the design of TNReady assessments. It is not intended to be used solely as an instructional resource or as a pacing guide. Districts should consult the Tennessee academic standards when making all instructional decisions, including scope and sequence. The Tennessee academic standards can be found [here](#).

Overview of High School Integrated Mathematics Testing Structure

As in the past, each year the state assessment includes both operational and field test items. The testing structure outlined below reflects both the number of operational assessment items and the number of field test items.

For scheduling purposes, subparts can be combined.

Subpart 1* (No Calculator)	Subpart 2 (Calculator)	Subpart 3 (Calculator)
<ul style="list-style-type: none"> • 35 Minutes • 13-18 Items 	<ul style="list-style-type: none"> • 50 Minutes • 11-25 Items 	<ul style="list-style-type: none"> • 60 Minutes • 11-20 Items

For scheduling purposes, subparts can be combined.

*For the TNReady mathematics assessments, subpart 1 is designed to measure number sense, conceptual understanding, and fluency. Fluency is the result of a process involving the interplay of practice and reasoning over time as opposed to the notion of memorizing facts devoid of meaning. Fluency is a focus on calculating in a manner that is accurate, flexible, and efficient. Subpart I of TNReady is taken without a calculator for this very reason. As a state, we are measuring how efficiently students work with mathematics. In order to be successful, students need to be equipped with a deep, conceptual understanding of Tennessee’s grade-level standards, strong number sense, and strategies that allow them to work mathematics fluently. It is not the expectation that all students will finish subpart I. It is the expectation that students who have a comprehensive understanding of their grade level standards and thorough ability to demonstrate fluency, number sense, and true conceptual understanding be able to complete the subpart in the allotted time.

High School Integrated Mathematics Blueprints

The blueprints reflect only operational assessment items. You can find the EOC mathematics standards [here](#).

For high school mathematics, approximately 60 percent of the assessment items gauge student mastery on major work of the grade. Approximately 40 percent of the items gauge student mastery on supporting and additional work.

Integrated Math I (M1)			
	# of Items	# of Score Points	% of Test
Structure and Operations <ul style="list-style-type: none"> ** M1.A.SSE.A-Interpret the structure of expressions. ** M1.A.SSE.B-Write expressions in equivalent forms to solve problems. M1.N.Q.A-Reason quantitatively and use units to solve problems. 	4-6	4-8	7-15
Equations and Inequalities <ul style="list-style-type: none"> ** M1.A.REI.A-Solve equations and inequalities in one variable M1.A.REI.B-Solve systems of equations. ** M1.A.REI.C-Represent and solve equations and inequalities graphically. * M1.A.CED.A-Create equations that describe numbers or relationships. 	8-12	10-14	18-25
Functions <ul style="list-style-type: none"> ** M1.F.IF.A-Understand the concept of a function and use function notation. ** M1.F.IF.B-Interpret functions that arise in applications in terms of the context. M1.F.IF.C-Analyze functions using different representations. ** M1.F.BF.A-Build a function that models a relationship between two quantities. M1.F.LE.A-Construct and compare linear and exponential models and solve problems. M1.F.LE.B-Interpret expressions for functions in terms of the situation they model. 	11-16	14-18	25-33
Geometry and Interpreting Data <ul style="list-style-type: none"> M1.G.CO.A-Experiment with transformations in the plane. ** M1.G.CO.B-Understand congruence in terms of rigid motions. ** M1.G.CO.C-Prove geometric theorems. 	13-16	14-18	25-33

<ul style="list-style-type: none"> • M1.S.ID.A-Summarize, represent, and interpret data on a single count or measurement variable. • M1.S.ID.B-Summarize, represent, and interpret data on two categorical and quantitative variables. • ** M1.S.ID.C-Interpret linear models. 			
Problem Solving	1	4-6	7-11
Total	37-51	50-60	100

**Math assessments must have a minimum of 55 score points.*

***Clusters with asterisks indicate major content of the grade.*

Integrated Math II (M2)			
	# of Items	# of Score Points	% of Test
Structure and Operations <ul style="list-style-type: none"> ** M2.N.RN.A-Extend the properties of exponents to rational exponents. ** M2.A.SSE.A-Interpret the structure of expressions. ** M2.A.SSE.B-Write expressions in equivalent forms to solve problems. ** M2.A.APR.A-Perform arithmetic operations on polynomials. M2.N.Q.A-Reason quantitatively and use units to solve problems. M2.N.CN.A-Perform arithmetic operations with complex numbers. M2.N.CN.B-Use complex numbers in polynomial identities and equations. 	13-18	16-20	29-36
Equations and Inequalities <ul style="list-style-type: none"> ** M2.A.CED.A-Create equations that describe numbers or relationships. ** M2.A.REI.A-Understand solving equations as a process of reasoning and explain the reasoning. ** M2.A.REI.B-Solve equations and inequalities in one variable. M2.A.REI.C-Solve systems of equations. 	6-10	8-12	15-22
Functions <ul style="list-style-type: none"> ** M2.F.IF.A-Interpret functions that arise in applications in terms of the context. M2.F.IF.B-Analyze functions using different representation. M2.F.BF.A-Build a function that models a relationship between two quantities. M2.F.BF.B-Build new functions from existing functions. 	6-8	6-10	11-18
Geometry and Interpreting Data <ul style="list-style-type: none"> ** M2.G.SRT.A-Understand similarity in terms of similarity transformations. ** M2.G.SRT.B-Prove theorems involving similarity. ** M2.G.SRT.C-Define trigonometric ratios and solve problems involving triangles. M2.G.GMD.A-Explain volume and surface area formulas and use them to solve problems. M2.S.ID.A-Summarize, represent, and interpret data on two categorical and quantitative variables. 	11-14	12-16	22-29

<ul style="list-style-type: none"> • M2.S.CP.A-Understand independence and conditional probability and use them to interpret data. • M2.S.CP.B-Use the rules of probability to compute probabilities of compound events in a uniform probability model. 			
Problem Solving	1	4-6	7-11
Total	37-51	*50-60	100

**Math assessments must have a minimum of 50 score points.*

***Clusters with asterisks indicate major content of the grade.*

Integrated Math III (M3)			
	# of Items	# of Score Points	% of Test
Structure and Operations <ul style="list-style-type: none"> • ** M3.A.SSE.A-Interpret the structure of expressions. • ** M3.A.SSE.B-Write expressions in equivalent forms to solve problems. • ** M3.A.APR.A-Understand the relationship between zeroes and factors of polynomials. • M3.A.APR.B-Use polynomial identities to solve problems. • M3.A.APR.C-Rewrite rational expressions. • M3.N.Q.A-Reason quantitatively and use units to solve problems. 	12-15	13-17	24-31
Equations and Inequalities <ul style="list-style-type: none"> • ** M3.A.CED.A-Create equations that describe numbers or relationships. • ** M3.A.REI.A-Understand solving equations as a process of reasoning and explain the reasoning. • ** M3.A.REI.B- Represent and solve equations graphically. • M3.G.GPE.A-Translate between the geometric description and the equation for a circle. • ** M3.G.GPE.B-Use coordinates to prove simple geometric theorems algebraically. 	11-15	13-17	24-31
Functions <ul style="list-style-type: none"> • ** M3.F.IF.A-Interpret functions that arise in applications in terms of the context. • M3.F.IF.B-Analyze functions using different representations. • M3.F.BF.A-Build new functions from existing functions. • M3.F.LE.A-Construct and compare linear, quadratic, and exponential models and solve problems. • M3.F.TF.A-Extend the domain of trigonometric functions using the unit circle. • M3.F.TF.B- Prove and apply trigonometric identities. 	7-10	8-12	15-22
Geometry and Interpreting Data <ul style="list-style-type: none"> • ** M3.G.MG.A-Apply geometric concepts in modeling situations. • M3.G.CO.A-Make geometric constructions. • M3.G.C.A-Understand and apply theorems about circles. • M3.G.C.B-Find areas of sectors of circles. • ** M3.S.ID.A-Summarize, represent, and interpret data on a single count or measurement variable. • ** M3.S.ID.B-Summarize, represent, and interpret data on two categorical and quantitative variables. 	10-12	10-14	18-25

<ul style="list-style-type: none"> ** M3.S.IC.B-Make inferences and justify conclusions from sample surveys, experiments, and observational studies. 			
Problem Solving	1	4-6	7-11
Total	41-53	50-60	100

**Math assessments must have a minimum of 50 score points.*

***Clusters with asterisks indicate major content of the grade.*

TNReady High School Mathematics Calculator Policy

Central Beliefs

The TNReady Calculator Policy is based on two central beliefs:

1. Calculators are important tools and, in order to be ready for career and college, students need to understand how to use calculators effectively.
2. In order to demonstrate mastery of the mathematics standards, students must demonstrate many skills without reliance on calculators.

Therefore, at all grade levels and in all courses, the math assessment will include both calculator-permitted subparts and calculator-prohibited subparts.

- There will be one calculator-prohibited subpart and two calculator-permitted subparts at all grade levels.
- Information on the types of questions on the calculator-prohibited section of TNReady can be found [here](#).

Rationale

Calculator functionalities should align with the mathematics in each grade band. In high school mathematics, our state standards focus on **solidifying** a student's ability to connect multiple representations for course-appropriate function types. Students are also **developing** an understanding of solving multiple types of algebraic equations. Students should not have calculator functionalities available to them for concepts that are in the developmental stage.

As stated within our central beliefs, students should have the opportunity to interact with technology and the opportunity to demonstrate critical thinking and problem solving with the aid of a calculator. However, in order to provide an equitable assessment experience for all Tennessee students, the type of calculator used by students should be consistent in functionality. As connection of multiple representations is in the solidifying phase over this grade band, students can have a calculator with full graphing capabilities. However, students do not need access to calculators with CAS (computer algebra systems). Thus, high school students will be allowed a **four-function, scientific, or graphing** calculator, which does not include any of the prohibited functionalities, on the calculator-permitted subparts.

Test Administration Guidelines

- It is the responsibility of the test administrator to ensure the regulations outlined in this policy pertaining to calculator use are followed.
- All memory and user-entered programs and documents must be cleared or removed before and after the test.
- A student may use any grade band-specific permitted calculator on the calculator-permitted subparts. For calculator-permitted subparts, students may use the platform-embedded online

calculator or a handheld calculator provided by the school/district or one owned personally.

Students may use either or both during the test.

- Students should have access to no more than one handheld calculator device for calculator-permitted subparts.
- Students will have access to practice with the same calculator functionalities that will be available on the operational assessment on both the item sampler and the practice tests.

Handheld Calculator Types

Students may use any four-function, scientific, or graphing calculator, which does not include any of the prohibited functionalities. *Please note: this is not an exhaustive list of calculator types, and students should be familiar with particular functions at the appropriate grade level.*

Examples of permitted calculators:

- Casio FX260
- Casio HS 4 Basic
- Sharp EL344RB
- Sharp ELSI Mate EL-2405A
- TI-15
- TI-30XA
- TI-30IIS
- TI-34
- TI-84 plus family
- TI-108
- TI-NSpire (non-CAS) and TI-NSpire-CX (non-CAS)

Examples of permitted functionalities:

- Square root (\sqrt{x})
- %
- Fraction manipulation
- Graphing capability
- Data entry
- Square key (x^2 or x^y)
- Pi (π)
- Trigonometric functions (sine, cosine, tangent)
- Matrices
- Regression

Examples of prohibited calculators:

- Casio CFX-9970
- HP-40G
- TI-89
- TI-NSpire (CAS version)

Examples of prohibited functionalities:

- Any calculator with CAS (computer algebra system) capabilities (including any programs or applications)
- Wireless communication capability
- QWERTY keyboard
- Cell phones, tablets, iPads, etc.

High School Mathematics Reference Sheet

The math assessment will allow reference sheets for all students in **grades five through high school**. The reference sheets are designed to match the intent of our current state standards in math. Below is the math reference sheet for high school.

TNReady Math Reference Sheet—High School	
1 inch = 2.54 centimeters	Exponential Growth: $y = a(1 + r)^t$
1 mile = 5280 feet	Exponential Decay: $y = a(1 - r)^t$
1 mile = 1760 yards	Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$
1 mile = 1.609 kilometers	Continually Compounding Interest: $A = Pe^{rt}$
1 kilometer = 0.62 mile	Arithmetic Sequence: $a_n = a_1 + (n - 1)d$
1 meter = 39.37 inches	Geometric Sequence: $a_n = a_1(r)^{n-1}$
1 pound = 16 ounces	Finite Geometric Series: $S_n = \frac{a_1(1-r^n)}{1-r}$
1 pound = 0.454 kilograms	Degrees: 1 degree = $\frac{\pi}{180}$ radians
1 kilogram = 2.2 pounds	Radians: 1 radian = $\frac{180}{\pi}$ degrees
1 ton = 2000 pounds	
1 cup = 8 fluid ounces	
1 pint = 2 cups	
1 quart = 2 pints	
1 gallon = 4 quarts	
1 gallon = 3.785 liters	
1 liter = 0.264 gallons	
1 liter = 1000 cubic centimeters	

TNReady High School Mathematics Item Types

This provides descriptions of TNReady item types for the 2017–18 school year. For further information about test structure, please refer to the assessment blueprints. For sample items, please see the practice tests posted to [EdTools](#).

Multiple choice: These are items with four answer options, only one of which is correct.

Multiple select: These are items with more than four answer choices with multiple correct responses. In EOC, sometimes the number of correct responses will be indicated (e.g., “choose the two correct answers”), but sometimes the number of correct responses will not be indicated (e.g., “select all of the correct answers”). These are item dependent and based on the standard.

Fill in the blank: Students must provide their mathematical solution to a problem. No written explanation is required. These are currently hand scored.

Integrated items: These are multipart, 4–6-point questions that ask students to assimilate information from multiple grade-level domains. They may require background knowledge from previous grades.

Two-part items: These are items with two parts, A and B, worth a total of two points. These are scored in two different ways depending on their type.

Type 1: The two parts of these items work independently of one another, and they are scored independently. Students can get one point for getting only part A correct, one point for only getting part B correct, or two points for getting both parts A and B correct.

Type 2: The two parts of these items are dependent on one another. These occur when students must use their answer from part A to create their answer for Part B. If a student misses part A but uses their answer correctly to solve part B, they would get one point for their part B answer.

Graphing: Students will be asked to provide a graphical representation. These may be on a number line or on a coordinate plane. All graphing items are currently hand scored.

Matching table: These items are tables where students are asked to match what appears on each row of a table with a correct response located in the columns of the table.

Drop-down menu: These items are statements where students will be asked to select options from a drop-down menu to complete a mathematical statement.