New York State Testing Program

Educator Guide to the Regents Examination in Algebra I

Next Generation Mathematics Learning Standards

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THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University

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Foreword

The information contained in this Educator Guide is designed to raise educator awareness of the structure of the New York State Regents Examination in Algebra I measuring the New York State Next Generation Mathematics Learning Standards.

The guide provides educators with pertinent information about the test development process, the learning standards that the test design is set to measure, the format of the testing session, including which types of questions will be asked, and which mathematics tools are allowed during testing. Links to additional resources are provided to further enhance educators' understanding of the structure of the Regents Examination in Algebra I. Educators are encouraged to review the guide prior to the test administration to gain familiarity with the test format. The information presented can also be used as a platform for educator discussion on how student assessment results can guide future instruction.

The High School Regents Examination testing schedule for the June 2024 administration can be found on the New York State Education Department's website. Questions regarding the New York State Testing Program and test design may be addressed to the Office of State Assessment at emscassessinfo@nysed.gov. Questions regarding the New York State Learning Standards may be addressed to the Office of Standards and Instruction at emscurric@nysed.gov.

New York State High School Mathematics Testing Program

In September 2017, the Board of Regents adopted the New York State Next Generation Mathematics Learning Standards, which were implemented at the beginning of the 2022-2023 school year. The New York State High School Mathematics Testing Program is designed to measure student progress on the Next Generation Mathematics Learning Standards following the implementation timeline for the Regents Examinations as follows:

- June 2024: Algebra I
- June 2025: Geometry
- June 2026: Algebra II

New York State Educators' Involvement in Test Development

Many steps in the test development process for the Regents Examination in Algebra I involve New York State-certified classroom teachers. For example, teachers write and revise all test questions and scoring rubrics. The New York State Education Department (NYSED) continues to expand the number of opportunities for New York State educators to become involved. New York State educators provide the critical input necessary to ensure that the tests are fair, valid, and appropriate for students through their participation in many test-development activities.

The test development process includes the development, review, and approval of test questions, construction of field and operational test forms, final approval of test forms prior to administration, and the development of scoring materials. NYSED remains committed to improving the quality of the State's assessments and the experiences that students have taking these tests. For more information on opportunities to participate in the test development process, please visit Test Development Participation.

The Next Generation Mathematics Learning Standards

The NYS Next Generation Mathematics Learning Standards define the knowledge and skills that individuals can and do habitually demonstrate over time when exposed to high-quality instructional environments and learning experiences. The Learning Standards, defined through the integration of the Standards for Mathematical Content and the Standards for Mathematical Practice, collectively, are focused and cohesive — designed to support student access to the knowledge and understanding of the mathematical concepts that are necessary to function in a world very dependent upon the application of mathematics. Students are expected to understand math conceptually, use procedural skills, and solve math problems rooted in the real world, deciding for themselves which strategies, formulas, and grade-appropriate tools (e.g., calculator, straightedge, or compass) to use.

Curriculum and instruction that support the content of the learning standards and the unique learning needs of students are locally determined by each individual district in New York State. Teacher preference and flexibility in planning units of study continue to play vital roles to both meet the needs of the students and align with the expectations of the learning standards. For additional guidance with instructional planning surrounding the Next Generation Mathematics Learning Standards, please see the Next Generation Mathematics Learning Standards.

Standards for Mathematical Practice

The Learning Standards for each grade level (and high school course) begin with the eight Standards for Mathematical Practice. The Standards for Mathematical Practice describe the ways in which developing practitioners increasingly should engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years. References to the integration of the Standards for Mathematical Content and the Standards for Mathematical Practice are provided throughout the Next Generation Mathematics Learning Standards.

Please note that the Algebra I overview does not include every standard/topic that should be included in instruction. Further information about the entire scope of the learning expectations for each grade level, as well as additional instructional considerations that include the within-grade connections, grade-level fluencies, and connecting the Standards for Mathematical Practice to Mathematical Content can be found in the Next Generation Mathematics Learning Standards and the associated grade-level crosswalks/snapshots.

Conceptual Categories, Domains, Clusters, Standards, and Assessment

The Algebra I Examination will measure the NYS Next Generation Mathematics Learning Standards. The NYS Next Generation Mathematics Learning Standards are divided into *conceptual categories, domains, clusters,* and *standards.*

- *Conceptual Categories* are the highest organizing level in the standards and portray a coherent view of high school mathematics.
- *Domains* are larger groups of related *clusters* and *standards*. *Standards* from different *domains* may be closely related.
- *Clusters* are groups of related *standards*. Note that *standards* from different *clusters* may sometimes be closely related, because mathematics is a connected subject.
- *Standards* define what students should understand and be able to do. In some cases, *standards* are further articulated into lettered components.

Algebra I is associated with the high school content standards within four conceptual categories: **Number & Quantity, Algebra, Functions,** and **Statistics & Probability**. The conceptual category of **Modeling** is also included in Algebra I, but is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards. Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions.

While all questions on the Regents Examination are linked to a primary standard, some questions measure more than one standard and one or more of the Standards for Mathematical Practice. Similarly, some questions measure cluster-level understandings. As a result of the alignment to standards, clusters, and Standards for Mathematical Practice, the test assesses students' conceptual understanding, procedural fluency, and problem-solving abilities, rather than assessing their knowledge of isolated skills and facts.

Regents Examination in Algebra I Blueprint

The test blueprint for the Regents Examination in Algebra I demonstrates NYSED's commitment to ensuring that educators are able to focus their instruction on the most critical elements of the Algebra I course.

The following chart shows the percent of test by credit, as well as the domains included in Algebra I for each conceptual category.

Conceptual Category	Percent of Test by Credits	Domains in Algebra I
Number & Quantity	4% - 10%	The Real Number System (N-RN) Quantities (N-Q)
Algebra	48% - 61%	Seeing Structure in Expressions (A-SSE) Arithmetic with Polynomials and Rational Expressions (A-APR) Creating Equations (A-CED) Reasoning with Equations and Inequalities (A-REI)
Functions	24% - 32%	Interpreting Functions (F-IF) Building Functions (F-BF) Linear, Quadratic, and Exponential Models (F-LE)
Statistics & Probability	7% - 15%	Interpreting Categorical and Quantitative Data (S-ID)

The chart on page 6 of this guide illustrates the relationship between the *conceptual categories*, *domains*, *clusters*, and *standards* that comprise Algebra I.

Conceptual Category	Domain	Cluster	Cluster Code	Standard
Number & Quantity 4% - 10%	The Real Number System	Use properties of rational and irrational numbers.	N-RN.B	N-RN.3(a,b)
	Quantities	Reason quantitatively and use units to solve problems.	N-Q.A	N-Q.1
				N-Q.3
Algebra 48% - 61%	Seeing Structure in Expressions	Interpret the structure of expressions.	A-SSE.A	A-SSE.1(a,b)
				A-SSE.2
		Write expressions in equivalent forms to reveal their characteristics.	A-SSE.B	A-SSE.3(c)
	Arithmetic with Polynomials and Rational Expressions	Perform arithmetic operations on polynomials.	A-APR.A	A-APR.1
		Understand the relationship between zeros and factors of polynomials.	A-APR.B	A-APR.3
	Creating Equations	Create equations that describe numbers or relationships.	A-CED.A	A-CED.1
				A-CED.2
				A-CED.3
				A-CED.4
	Reasoning with Equations and Inequalities	Understand solving equations as a process of reasoning and explain the reasoning.	A-REI.A	A-REI.1a
		Solve equations and inequalities in one variable.	A-REI.B	A-REI.3
				A-REI.4(a,b)
		Solve systems of equations.	A-REI.C	A-REI.6a
				A-REI.7a
		Represent and solve equations and inequalities graphically.	A-REI.D	A-REI.10
				A-REI.11
				A-REI.12
Functions 24% - 32%	Interpreting Functions	Understand the concept of a function and use function notation.	F-IF.A	F-IF.1
				F-IF.2
				F-IF.3
		Interpret functions that arise in applications in terms of the context.	F-IF.B	F-IF.4
				F-IF.5
				F-IF.6
		Analyze functions using different representations.	F-IF.C	F-IF.7(a,b)
				F-IF.8(a)
				F-IF.9
	Building Functions	Build a function that models a relationship between two quantities.	F-BF.A	F-BF.1a
		Build new functions from existing functions.	F-BF.B	F-BF.3a
	Linear, Quadratic and Exponential Models	Construct and compare linear, quadratic, and exponential models and solve problems.	F-LE.A	F-LE.1(a,b,c)
				F-LE.2
				F-LE.3
		Interpret expressions for functions in terms of the situation they model.	F-LE.B	F-LE.5
Statistics & Probability 7% - 15%	Interpreting Categorical and Quantitative Data	Summarize, represent, and interpret data on a single count or measurement variable.	S-ID.A	S-ID.1
				S-ID.2
				S-ID.3
		Summarize, represent, and interpret data on two categorical and quantitative variables.	S-ID.B	S-ID.5
				S-ID.6(a)
		Interpret linear models.	S-ID.C	S-ID.7
				S-ID.8
				S-ID.9

Algebra I Examination: Time, Format, Design, and Scoring

Testing Session and Time

The Regents Examination in Algebra I will consist of one booklet that is administered during the designated time determined by NYSED. Students are permitted three hours to complete the Regents Examination in Algebra I. While it is likely that most students will complete the test in less than three hours, students may not leave the testing location prior to the Uniform Admission Deadline. This design provides ample time for students who work at different paces.

Question Formats

The Regents Examination in Algebra I contains multiple-choice and constructed-response questions. For multiple-choice questions, students select the correct response from four answer choices. For constructed-response questions, students are required to clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. In some cases, they may be required to explain, in words, how they arrived at their answers. Students must also have the exclusive use of a graphing calculator for the full duration of the examination. For more information about calculator use please refer to page 10 of this document.

Multiple-choice questions will be used to assess procedural fluency and conceptual understanding. Multiple-choice questions measure the Standards for Mathematical Content and may incorporate Standards for Mathematical Practices and real-world applications. Some multiple-choice questions require students to complete multiple steps. Likewise, questions may measure more than one cluster, drawing on the simultaneous application of multiple skills and concepts. Within answer choices, distractors[1] will be based on plausible missteps.

Constructed-response questions will require students to show a deep understanding of mathematical procedures, concepts, and applications. The Regents Examination in Algebra I contains 2-, 4-, and 6-credit constructed-response questions.

The 2-credit constructed-response questions require students to complete a task and show their work. These questions may involve multiple steps, the application of multiple mathematics skills, and real-world applications. These questions may ask students to explain or justify their solutions and/or show their process of problem solving.

The 4-credit and 6-credit constructed-response questions require students to show their work in completing more extensive problems that may involve multiple tasks. Students may be asked to make sense of mathematical and real-world problems in order to demonstrate procedural and conceptual understanding. These questions may ask students to explain or justify their solutions and/or show their process of problem solving.

[1] A distractor is an incorrect response that may appear to be a plausible correct response to a student who has not mastered the skill or concept being tested.

Algebra I Examination Design

Test Component	Number of Questions	Credits per Question	Credits per Section
Part I	24	2	48
Part II	6	2	12
Part III	4	4	16
Part IV	1	6	6
Total	35	-	82

Algebra I Scoring Policies

The general procedures to be followed in scoring Regents Examinations are provided in the publications Directions for Administering Regents Examinations (DET 541) and the School Administrator's Manual. Both of these documents are available on the Department's website. For more information see the Information Booklet for Scoring the Regents Examination in Algebra I, the Directions for Administering Regents Examinations, the Scoring Key and Rating Guides, and the Model Response Set for the appropriate examination.

Policy Definitions

For each subject area, students perform along a continuum of the knowledge and skills necessary to meet the demands of the Learning Standards for Mathematics. Regents Examinations are designed to classify student performance into one of five levels based on the knowledge and skills the student has demonstrated. Due to the need to identify student proficiency, the State tests must provide students at each performance level opportunities to demonstrate their knowledge and skills in the Next Generation Mathematics Learning Standards.

These performance levels are defined as:

NYS Level 5

Students performing at this level **meet with distinction** grade-level expectations of learning standards.

NYS Level 4

Students performing at this level **fully meet** grade-level expectations of learning standards (likely prepared to succeed in the next level of coursework).

NYS Level 3

Students performing at this level **minimally meet** grade-level expectations of learning standards (meet the content area requirements for a Regents diploma but may need additional support to succeed in the next level of coursework).

NYS Level 2 (Safety Net)

Students performing at this level **partially meet** grade-level expectations of learning standards (sufficient for Local Diploma purposes).

NYS Level 1

Students performing at this level demonstrate knowledge and skills below Level 2.

Performance Level Descriptions

Performance Level Descriptions exemplify the knowledge and skills that students at each performance level demonstrate and describe the progression of learning within a subject area. The Performance Level Descriptions play a central role in the test development process, specifically question-writing and standard-setting. For more information about the Next Generation Mathematics Learning Standards Performance Level Descriptions for Algebra I, please see the Algebra I webpage.

Mathematics Tools for the Regents Examination in Algebra I

Calculators and Straightedges (rulers)

A graphing calculator and straightedge (ruler) **must** be available to all students taking the Regents Examination in Algebra I. No students may use calculators that are capable of symbol manipulation or that can communicate with other calculators through infrared sensors, nor may students use operating manuals, instruction or formula cards, or other information concerning the operation of calculators during the test. For more information regarding calculators see The Guidelines for Graphing Calculator Use and the Directions for Administering Regents Examinations.

Note: Schools are responsible for supplying the appropriate tools for use with the Regents Examination in Algebra I.

Value of Pi

Students should use the π symbol and its corresponding value (i.e. pi key on the calculator) when applicable on the Regents Examination in Algebra I. Unless otherwise specified, use of the approximate values of π, such as 3.1416, 3.14, or $\frac{22}{7}$ are unacceptable.

Mathematics Tools

The use of tools is necessary for students to meet the Standards for Mathematical Practice in the Next Generation Mathematics Learning Standards for Mathematics. For example:

Use appropriate tools strategically

Mathematically proficient students consider the available tools when solving a mathematical problem. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attend to precision

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, expressing numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school, they have learned to examine claims and make explicit use of definitions.

Reference Sheet

A detachable reference sheet will be included at the end of the Regents Examination in Algebra I test booklet. It contains information that students are expected to apply, but not necessarily memorize. Teachers should use this reference sheet in instruction throughout the Algebra I course to familiarize students with its content.

This reference sheet is available at
https://www.nysed.gov/sites/default/files/programs/state-assessment/a1-next-gen-reference-sheet.pdf

Appendix A: Sample Questions for the Regents Examination in Algebra I

To aid in the implementation of the Next Generation Mathematics Learning Standards, a limited number of sample questions are being provided to help students, parents, and educators better understand the shifts of the NGMLS. The five questions below illustrate these shifts for Algebra I.

While educators from around the state have helped craft these sample questions, they have not undergone the same extensive review, vetting, and field testing that occurs with actual questions used on the State exams. The sample questions were designed to help educators think about content, NOT to show how operational exams look exactly or to provide information about how teachers should administer the test.

1. N-RN.3a

What is the sum of $3x\sqrt{7} + 2x\sqrt{7}$?

(1) $5x\sqrt{7}$

(2) $5x^2\sqrt{7}$

(3) $5x\sqrt{14}$

(4) $5x^2\sqrt{14}$

2. A-REI.10

What is an equation of the line that passes through the points (2,7) and (-1,3)?

(1) $y - 2 = \frac{3}{4}(x - 7)$

(2) $y - 2 = \frac{4}{3}(x - 7)$

(3) $y - 7 = \frac{3}{4}(x - 2)$

(4) $y - 7 = \frac{4}{3}(x - 2)$

3. N-RN.3a

Rationalize: $\frac{3}{2\sqrt{6}}$

4. A-REI.4b

Use the method of completing the square to determine the exact values of *x* for the equation $x^2 + 6x - 41 = 0$. Express your answer in simplest radical form.

5. A-REI.7a

Solve the following systems of equations algebraically for all values of *x* and *y*:

$$y = x^2 + 5x - 17$$

$$x - y = 5$$

Answer Key to Algebra I Sample Items

1. Choice 1
2. Choice 4
3. Rubric

[2] $\frac{3\sqrt{6}}{12}$ or an equivalent answer with no radical in the denominator, and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] $\frac{3\sqrt{6}}{12}$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

4. Rubric

[4] $-3 \pm 5\sqrt{2}$, and correct work is shown.

[3] Appropriate work is shown, but one computational or simplification error is made.

or

[3] Appropriate work is shown, but only one solution is stated.

[2] Appropriate work is shown, but two or more computational or simplification errors are made.

or

[2] Appropriate work is shown to find $-3 \pm \sqrt{50}$, but no further correct work is shown.

or

[2] $-3 \pm 5\sqrt{2}$, but a method other than completing the square is used.

[1] $-3 \pm 5\sqrt{2}$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a response that was obtained by an obviously incorrect procedure.

5. Rubric

[4] $x = -6$, $y = -11$ and $x = 2$, $y = -3$ or $(-6, -11)$ and $(2, -3)$, and correct algebraic work is shown.

[3] Appropriate work is shown, but one computational or factoring error is made.

or

[3] Appropriate work is shown to find $x = -6$ and $x = 2$, but no further correct work is shown.

or

[3] Appropriate work is shown to find either $(-6, -11)$ or $(2, -3)$, but no further correct work is shown.

[2] Appropriate work is shown, but two or more computational or factoring errors are made.

or

[2] Appropriate work is shown to find $(x + 6)(x - 2) = 0$, but no further correct work is shown.

or

[2] A correct substitution is made into the quadratic formula, but no further correct work is shown.

or

[2] $x = -6$, $y = -11$ and $x = 2$, $y = -3$, but a method other than algebraic is used.

[1] A correct quadratic equation in standard form is written, but no further correct work is shown.

or

[1] $x = -6$, $y = -11$ and $x = 2$, $y = -3$ are stated, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a response that was obtained by an obviously incorrect procedure.