New York State Testing Program

Educator Guide to the Regents Examination in Algebra I (Common Core)

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MERRYL H. TISCH, *Chancellor*, B.A., M.A., Ed.D.	New York
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KATHLEEN M. CASHIN, B.S., M.S., Ed.D.	Brooklyn
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T. ANDREW BROWN, B.A., J.D.	Rochester

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Director of State Assessment
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Regents Examination in Algebra I (Common Core) Test Guide

Foreword

Beginning with the 2012-2013 school year, the New York State Education Department (NYSED) started redesigning its testing program to measure what students know and can do relative to the New York State P-12 Common Core Learning Standards (CCLS) for Mathematics. The CCLS for Mathematics make up a broad set of mathematics understandings for students, defined through the integration of the Standards for Mathematical Content and the Standards for Mathematical Practice. In June 2014, the Regents Examination in Algebra I (Common Core) measuring the CCLS will be administered for the first time.

The Regents Examination in Algebra I (Common Core) is designed to measure student mathematical understanding as defined by the CCLS. As such, there will be a noticeable change in **rigor** from the Regents Examination in Integrated Algebra.

The September 2013 memorandum, "Transition to Common Core Regents Examinations in English Language Arts and Mathematics" provides further information on the phase in schedule for this new mathematics examination and for new Regents Examinations in Geometry (Common Core) and Algebra II, which will follow in subsequent school years. This memorandum can be found at http://www.p12.nysed.gov/assessment/commoncore/transitionccregents1113.pdf.

The CCLS define rigor around procedural fluency, conceptual understanding, and application to real-world problems. Many questions will require that students be fluent in earlier grade-level skills. Some questions will require students to show their procedural and conceptual proficiency on specific concepts in distinct ways. In addition, students will be asked to negotiate multistep questions that require knowledge and ability across more than one grade-level standard.

Students will be expected to understand math conceptually, use prerequisite skills with grade-level math facts, and solve math problems rooted in the real world, deciding for themselves which formulas and tools (e.g. graphing calculators or rulers) to use.

This guide details many of the changes involved with the newly designed tests that measure the CCLS for Mathematics. While reading about each of the changes will help in understanding how to prepare students for the upcoming test, it is important to remember that research has consistently demonstrated that students perform best on local, regional, statewide, or national tests when they have a great teacher delivering high-quality instruction aligned to rigorous standards[1]. Rote test prep practices are incompatible with highly effective teaching and lead to lower student performance[2].

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1 See, for example, http://ccsr.uchicago.edu/publications/authentic-intellectual-work-and-standardizedtests-conflict-or-coexistence.

2 See, for example, http://metproject.org/downloads/MET_Gathering_Feedback_Research_Paper.pdf.

Common Core Regents Examinations in Mathematics

As part of the New York State Board of Regents Reform Agenda, the New York State Education Department (NYSED) has embarked on a comprehensive reform initiative to ensure that schools prepare students with the knowledge and skills they need to be college and career ready.

The New York State P–12 CCLS call for changes in what is expected from a teacher's instructional approach. In mathematics courses, the CCLS demand that teachers focus their instruction on fewer, more central standards (http://engageny.org/resource/math-content-emphases/), thereby providing room to build core understandings and connections between mathematical concepts and skills.

Instructional Shifts and how they will be reflected in the Mathematics Assessments

The CCLS for Mathematics will require changes in instruction. There are six instructional shifts required to ensure that curriculum materials and classroom instruction are truly measuring the Standards. Educators should focus instruction on the Standards and six key shifts in mathematics http://www.engageny.org/resource/common-core-shifts. Each of the six shifts will be evident in the new assessments. The table below shows the ways that instructors can expect the mathematics assessments will differ from past assessments through the lens of the six shifts.

Common Core Shifts in Mathematics Assessments	
Shift 1: Focus	Priority standards, which are embedded in the major clusters, will be the focus of assessments. Other standards will be deemphasized.
Shift 2: Coherence	Assessments will reflect the progression of content and concepts as depicted in the standards across grade levels.
Shift 3: Fluency	At the high school level, assessments will require fluency in areas described by the PARCC Model Content Framework for Algebra I, including manipulating algebraic expressions and working with the equations of lines.
Shift 4: Deep Understanding	Standards will be assessed from multiple perspectives, while not veering from the primary target of measurement for the standard.
Shift 5: Application Shift 6: Dual Intensity	Students will be expected to know grade-level mathematical content with fluency and to know which mathematical concepts to employ to solve real-world mathematics problems.

The New York State testing program has been redesigned to measure student learning aligned with the instructional shifts necessitated by the CCLS. This document provides specific details about the Regents Examination in Algebra I (Common Core) and the Standards that it measures.

Regents Examination in Algebra I (Common Core)

All questions on the Regents Examination in Algebra I will measure the Common Core Algebra I Standards as specified in the PARCC Model Content Framework for Algebra I, which can be found at http://www.parcconline.org/parcc-model-content-frameworks. The Standards define what students should understand and be able to do at the high school level; the Model Content Framework describes which content is included and emphasized within the Algebra I course, specifically.

Conceptual Categories

Conceptual categories are the highest organizing level in the high school CCLS for Mathematics. These conceptual categories are divided into *domains, clusters, and standards.*

- *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 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.

Regents Examination in Algebra I (Common Core) Blueprint

Many steps in the test development process for the Regents Examination in Algebra I (Common Core) involve New York State-certified classroom teachers. For example, teachers write and revise test questions and scoring rubrics.

The test blueprint for the Regents Examination in Algebra I (Common Core) 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 test blueprint shows that the Algebra conceptual category contains 50% - 56% of the credits, the Functions conceptual category contains 32% - 38% of the credits, the Number and Quantity conceptual category contains 2% - 8% of the credits and Statistics and Probability conceptual categories contains 5% - 10% of the credits on the exam. The Algebra I test blueprint can be found at http://www.engageny.org/resource/regents-exams-mathematics

The following chart shows the percent of test by credit from the blueprint, 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	2% - 8%	The Real Number System (N-RN) Quantities (N-Q)
Algebra	50% - 56%	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	32% - 38%	Interpreting Functions (F-IF) Building Functions (F-BF) Linear, Quadratic, and Exponential Models (F-LE)
Statistics & Probability	5% - 10%	Interpreting categorical and quantitative data (S-ID)

Content Emphases

Within each domain, the Algebra I CCLS are divided into *Major Clusters*, *Supporting Clusters*, and *Additional Clusters*. **The Algebra I Regents Exam will mirror the organization of the standards: Major Clusters will account for a majority (58% - 73%) of the credits on the test, while Supporting Clusters (18% - 30%) and Additional Clusters (5% - 17%) will together constitute less than half of the possible credits.** Although clusters will be assessed more than once depending on the cluster emphases, the knowledge and skills necessary, or the context, will be distinctly different for each question. This will ensure that students have the opportunity to earn credit on every question regardless of how they performed on earlier questions — even those aligned to the same cluster.

The chart on the following page illustrates the different clusters for instructional emphasis; additionally, the chart shows the standards that are shared by Algebra I and Algebra II. Assessment limits for shared standards are necessary to provide information on how a shared standard is assessed differently for each course. For more information about assessment limits for shared standards please refer to PARCC Model Content Framework for Algebra I.

The Algebra I Standards Clarifications offer further specific information regarding some of the standards for the course: http://www.engageny.org/resource/regents-exams-mathematics-algebra-i-standards-clarifications.

Conceptual Category	Domain	Cluster	Cluster Emphasis	Standard	Shared with Algebra II
Number & Quantity 2% - 8%	Quantities	Reason quantitatively and use units to solve problems.	Supporting	N-Q.1	
				N-Q.2	x
				N-Q.3	
	The Real Number System	Use properties of rational and irrational numbers.	Additional	N-RN.3	
Algebra 50% - 56%	Seeing Structure in Expressions	**Interpret the structure of expressions.**	**Major**	A-SSE.1	
				A-SSE.2	x
		Write expressions in equivalent forms to solve problems.	Supporting	A-SSE.3	x (c)
	Arithmetic with Polynomials and Rational Expressions	**Perform arithmetic operations on polynomials.**	**Major**	A-APR.1	
		Understand the relationship between zeros and factors of polynomials.	Supporting	A-APR.3	x
	Creating Equations	**Create equations that describe numbers or relationships.**	**Major**	A-CED.1	x
				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.1	x
		Solve equations and inequalities in one variable.		A-REI.3	
				A-REI.4	x (b)
		Represent and solve equations and inequalities graphically.		A-REI.10	
				A-REI.11	x
				A-REI.12	
		Solve systems of equations.	Additional	A-REI.5	
				A-REI.6	x
Functions 32% - 38%	Interpreting Functions	**Understand the concept of a function and use function notation.**	**Major**	F-IF.1	
				F-IF.2	
				F-IF.3	x
		Interpret functions that arise in application in terms of the context.		F-IF.4	x
				F-IF.5	
				F-IF.6	x
		Analyze functions using different representations.	Supporting	F-IF.7 (a,b)	
				F-IF.8 (a)	
				F-IF.9	x
	Building Functions	Build a function that models a relationship between two quantities.		F-BF.1 (a)	x
		Build new functions from existing functions.	Additional	F-BF.3	x
	Linear, Quadratic and Exponential Models	Construct and compare linear, quadratic, and exponential models and solve problems.	Supporting	F-LE.1	
				F-LE.2	x
				F-LE.3	
		Interpret expressions for functions in terms of the situation they model.		F-LE.5	x
Statistics & Probability 5% - 10%	Interpreting Categorical and Quantitative Data	**Interpret linear models.**	**Major**	S-ID.7	
				S-ID.8	
				S-ID.9	
		Summarize, represent and interpret data on two categorical and quantitative variables.	Supporting	S-ID.5	
				S-ID.6	x (a)
		Summarize, represent and interpret data on a single count or measurement variable.	Additional	S-ID.1	
				S-ID.2	
				S-ID.3	

Testing Session and Time

The Regents Examination in Algebra I (Common Core) 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 (Common Core). 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.

The tests must be administered under standard conditions and the directions must be followed carefully. The same test administration procedures must be used with all students so that valid inferences can be drawn from the test results. Students with disabilities must be provided testing accommodations as stated in their Individualized Education Programs (IEPs) or Section 504 Accommodation Plans (504 Plans). For additional information, go to http://www.p12.nysed.gov/assessment/sam/secondary/hs-sam-13rev.pdf

NYSED devotes great attention to the security and integrity of the Regents Exams. School administrators and teachers involved in the administration of State examinations are responsible for understanding and adhering to the instructions set forth in the *Directions for Administering Regents Examinations*. These resources will be posted prior to each Regents Examination at http://www.p12.nysed.gov/assessment/hsgen/

In Algebra I, students answer two types of questions: multiple choice and constructed response. The Regents Examination in Algebra I (Common Core) will consist of four parts. Part I consists of multiple-choice questions and Parts II, III, and IV consist of constructed-response questions. **Students must 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 7 of this document.

Question Formats

The Regents Examination in Algebra I (Common Core) 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.

Multiple-Choice Questions

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 all be based on plausible missteps.

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.

Constructed-Response Questions

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

2-credit constructed-response questions require students to complete a task and show their work. Like multiple-choice questions, 2-credit constructed-response questions will often 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.

4-credit and 6-credit constructed-response questions require students to show their work in completing more extensive problems which may involve multiple tasks. Students will be asked to make sense of mathematical and real-world problems in order to demonstrate procedural and conceptual understanding. For 6-credit constructed-response questions, students will analyze, interpret, and/or create mathematical models of real-world situations.

2014 Regents Examination in Algebra I (Common Core) Design

Test Component	Number of Questions	Credits per Question	Total Credits per Section
Part I	24	2	48
Part II	8	2	16
Part III	4	4	16
Part IV	1	6	6
Total	37	-	86

Additional Assessment Resources

Sample Questions for the Regents Examination in Algebra I (Common Core) are available at http://www.engageny.org/resource/regents-exams-mathematics-algebra-i-sample-items

Math Item Review Criteria and Multiple Representations are available at http://www.engageny.org/resource/regents-exams-mathematics

Regents Examination in Mathematics Scoring Policies

The Algebra I scoring policies will follow the same guidelines as previous mathematics Regents Examinations. For more information see the *Information Booklet for Scoring the Regents Examinations in Mathematics* at http://www.p12.nysed.gov/assessment/hsgen/home.html.

Mathematics Tools for the Regents Examination in Algebra I (Common Core)

Calculators and Straightedges (rulers)

A graphing calculator and straightedge (ruler) **must** be available to all students taking the Regents Examination in Algebra I (Common Core). 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 Directions for Administering Regents Examinations, at http://www.p12.nysed.gov/assessment/hsgen/home.html

Note: Schools are responsible for supplying the appropriate tools for use with the Regents Examination in Algebra I (Common Core). NYSED does not provide them.

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.

Why Mathematics Tools?

These provisions are necessary for students to meet the Standards for Mathematical Practice in the New York State P-12 Common Core 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 (Common Core) booklet.

Common Core High School Math Reference Sheet
(Algebra I, Geometry, Algebra II)

CONVERSIONS

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers
1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilograms
1 kilogram = 2.2 pounds
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 gallon
1 liter = 1000 cubic centimeters

FORMULAS

Triangle	$A=\frac{1}{2}bh$	Pythagorean Theorem	$a^2+b^2=c^2$
Parallelogram	$A=bh$	Quadratic Formula	$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
Circle	$A=\pi r^2$	Arithmetic Sequence	$a_n=a_1+(n-1)d$
Circle	$C=\pi d$ or $C=2\pi r$	Geometric Sequence	$a_n=a_1r^{n-1}$
General Prisms	$V=Bh$	Geometric Series	$S_n=\frac{a_1-a_1r^n}{1-r}$ where $r\neq 1$
Cylinder	$V=\pi r^2h$	Radians	$1\,\text{radian}=\frac{180}{\pi}\,\text{degrees}$
Sphere	$V=\frac{4}{3}\pi r^3$	Degrees	$1\,\text{degree}=\frac{\pi}{180}\,\text{radians}$
Cone	$V=\frac{1}{3}\pi r^2h$	Exponential Growth/Decay	$A=A_0e^{k(t-t_o)}+B_0$
Pyramid	$V=\frac{1}{3}Bh$		