New York State Testing Program

Educator Guide to the Regents Examination in Geometry

Revised October 2017

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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 2015, the Regents Examination in Geometry measuring the CCLS will be administered for the first time.

The Regents Examination in Geometry is designed to measure student mathematical understanding as defined by the CCLS. As such, there will be noticeable changes from the Regents Examination in Geometry that measure the 2005 NYS Geometry Standards.

The November 2013 memorandum, "Transition to Common Core Regents Examinations in English Language Arts and Mathematics" provides information on the phase-in schedule for all Mathematics Regents Examinations in Algebra I, Geometry, and Algebra II. Further information may also be found in the February 2014 memorandum "CCLS and Assessments."

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 calculator, straightedge, or compass) to use.

This guide details many of the changes involved with the newly designed Regents Examination in Geometry that measures the CCLS for Mathematics. Although 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]

[1] See, for example, http://ccsr.uchicago.edu/publications/authentic-intellectual-work-and-standardized-tests-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, thereby providing time 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 aligned with the standards. Educators should focus instruction on the standards and six key shifts in mathematics. 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 Geometry, including triangle congruence and similarity, coordinates, and construction tools.
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 Geometry and the Standards that it measures.

Regents Examination in Geometry

All questions on the Regents Examination in Geometry will measure the Common Core Geometry Standards as specified in the PARCC Model Content Framework for Geometry. 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 Geometry course, specifically.

Conceptual Categories

Conceptual categories are the highest organizing level in the high school CCLS for Mathematics. There are two conceptual categories associated with Geometry: **Modeling** and **Geometry**.

The conceptual category of Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. The conceptual category of Geometry is the only conceptual category that is linked to specific domains within the Geometry course. The Geometry conceptual category is 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*.

Regents Examination in Geometry Blueprint

New York State-certified teachers were involved in most stages of the test development process for the Regents Examination in Geometry. For example, teachers write and revise test questions and scoring rubrics.

The test blueprint for the Regents Examination in Geometry demonstrates NYSED's commitment to ensuring that educators are able to focus their instruction on the most critical elements of the Geometry course. Because Geometry is the only conceptual category in the Geometry CCLS linked to specific domains, the percentages given are at the domain level and not at the conceptual category level as reported for Algebra I. The following chart shows the percent of test by credit for the domains in Geometry.

Conceptual Category	Domains in Geometry	Percent of Test By Credit
Geometry	Congruence (G-CO)	27%–34%
	Similarity, Right Triangles, and Trigonometry (G-SRT)	29%–37%
	Circles (G-C)	2%–8%
	Expressing Geometric Properties with Equations (G-GPE)	12%–18%
	Geometric Measurement & Dimensions (G-GMD)	2%–8%
	Modeling with Geometry (G-MG)	8%–15%

Content Emphases

Within each domain, the Geometry CCLS are divided into *Major Clusters*, *Supporting Clusters*, and *Additional Clusters*. The test will strongly focus where the standards focus. Major Clusters will be a majority (68–83%) of the test, while Supporting Clusters (4–14%) and Additional Clusters (12–24%) will together constitute less than half the possible points. 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 below illustrates the different domains and clusters for Geometry. Additionally, the chart shows the Major, Supporting, and Additional cluster emphases as established in the PARCC Model Content Framework for Geometry.

Conceptual Category	Domain	Cluster	Cluster Emphasis	Standard
Geometry	Congruence 27% - 34%	Experiment with transformations in the plane	Supporting	G-CO.1
				G-CO.2
				G-CO.3*
				G-CO.4
				G-CO.5
		Understand congruence in terms of rigid motions	**Major**	G-CO.6
				G-CO.7
				G-CO.8
		Prove geometric theorems		G-CO.9*
				G-CO.10*
				G-CO.11*
		Make geometric constructions	Supporting	G-CO.12*
				G-CO.13
	Similarity, Right Triangles, & Trigonometry 29% - 37%	**Understand similarity in terms of similarity transformations**	**Major**	G-SRT.1a
				G-SRT.1b
				G-SRT.2
				G-SRT.3
		Prove theorems involving similarity		G.SRT.4*
				G.SRT.5*
		Define trigonometric ratios and solve problems involving right triangles		G.SRT.6
				G.SRT.7
				G.SRT.8
	Circles 2% - 8%	Understand and apply theorems about circles	Additional	G.C.1
				G.C.2*
				G.C.3
		Find arc lengths and areas of sectors of circles		G.C.5
	Expressing Geometric Properties with Equations 12% - 18%	Translate between the geometric description and the equation for a conic section	Additional	G.GPE.1
		Use coordinates to prove simple geometric theorems algebraically	**Major**	G.GPE.4
				G.GPE.5
				G.GPE.6
				G.GPE.7
	Geometric Measurement & Dimensions 2% - 8%	Explain volume formulas and use them to solve problems	Additional	G.GMD.1
				G.GMD.3
		Visualize relationships between two-dimensional and three-dimensional objects		G.GMD.4
	Modeling with Geometry 8% - 15%	**Apply geometric concepts in modeling situations**	**Major**	G.MG.1
				G.MG.2
				G.MG.3

* Indicates the Standard has a NYS clarification. See Geometry Standards Clarification document.

Testing Session and Time

The Regents Examination in Geometry 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 Geometry. 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 test 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). Additional information is available in the School Administrator's Manual.

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/.

Question Formats

The Regents Examination in Geometry contains four parts with 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, proofs, etc. In some cases, they may be required to provide written explanations or justifications to demonstrate conceptual understanding.

Multiple-Choice Questions

Multiple-choice questions will primarily 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.

Constructed-Response Questions

Constructed-response questions will require students to show a deep understanding of mathematical procedures, concepts, and applications as well as demonstrating geometric concepts through constructions. The Regents Examination in Geometry contains 2-, 4-, and 6-credit constructed-response questions.

2-credit constructed-response questions require students to complete a task and show their work.

[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.

Like multiple-choice questions, 2-credit constructed-response 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.

Constructed-response questions that are worth 4 credits require students to show their work in completing more extensive problems which may involve multiple tasks and concepts. Students will need to reason abstractly by constructing viable arguments to explain, justify, and/or prove geometric relationships in order to demonstrate conceptual understanding. Students will also need to reason quantitatively when solving real-world modeling problems.

As a result of feedback received from NYS educators, the Regents Examination in Geometry will be reduced by one 6-credit constructed-response question beginning with the January 2018 administration. This reduction is intended to help students attend to the questions on the test at a pace that is optimum for them to demonstrate their knowledge and skills of the Geometry Standards and have sufficient time to complete the test. The remaining 6-credit constructed-response question will require students to develop multi-step, extended logical arguments and proofs involving major content. The examination will no longer include the 6-credit constructed-response question that required students to use modeling to solve real-world problems. The knowledge and skills assessed by the eliminated 6-credit question will be assessed in other parts of the test.

The total number of credits on the test will decrease from 86 to 80 with the reduction of a 6-credit constructed-response question. The table below shows the new design for the Regents Examination in Geometry. The table below shows the new design for the Regents Examination in Geometry.

Regents Examination in Geometry Design

Test Component	Number of Questions	Credits per Question	Total Credits in Section
Part I	24	2	48
Part II	7	2	14
Part III	3	4	12
Part IV	1	6	6
Total	35	-	80

Additional Assessment Resources

Additional Multiple Representations are available at:
http://www.engageny.org/resource/regents-exams-mathematics-multiple-representations.

Regents Examination in Mathematics Scoring Policies

The Geometry scoring policies will follow the same guidelines as previous mathematics Regents Examinations. For more information see the *Information Booklet for Scoring the Regents Examination in Geometry*.

Mathematics Tools for the Regents Examination in Geometry

Calculators

Students must have the exclusive use of a Graphing Calculator for the full duration of the Regents Examination in Geometry. 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.

Compasses and Straightedges (rulers)

A compass and straightedge (ruler) must be available to all students taking the Regents Examination in Geometry.

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

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	$V=\frac{1}{3}Bh$		