

Georgia
Milestones
Assessment System



Assessment Guide
Geometry



Assessment Guide

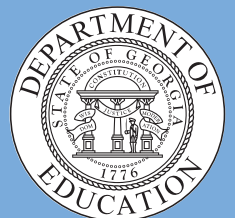


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THE GEORGIA MILESTONES ASSESSMENT SYSTEM

The purpose of the Georgia Student Assessment Program is to measure student achievement of the state-adopted content standards and inform efforts to improve teaching and learning. Results of the assessment program are utilized to identify students failing to achieve mastery of content, to provide educators with feedback about instructional practice, and to assist school districts in identifying strengths and weaknesses in order to establish priorities in planning educational programs.

The State Board of Education is required by Georgia law (O.C.G.A. §20-2-281) to adopt assessments designed to measure student achievement relative to the knowledge and skills set forth in the state-adopted content standards. The Georgia Milestones Assessment System (Georgia Milestones) fulfills this requirement and, as a key component of Georgia's Student Assessment Program, is a comprehensive summative assessment program spanning Grade 3 through high school. Georgia Milestones measures how well students have learned the knowledge and skills outlined in the state-adopted content standards in Language Arts, Mathematics, Science, and Social Studies. Students in grades 3 through 8 take an end-of-grade assessment in English Language Arts and Mathematics, while students in grades 5 and 8 also take an end-of-grade assessment in Science and Social Studies. High school students take an end-of-course assessment for each of the ten courses designated by the State Board of Education. In accordance with State Board Rule, Georgia Milestones end-of-course measures serve as the final exams for the specified high school courses.

The main purpose of Georgia Milestones is to inform efforts to improve student achievement by assessing student performance on the standards specific to each course or subject/grade tested. Specifically, Georgia Milestones is designed to provide students and their parents with critical information about the students' achievement and, importantly, their preparedness for the next educational level. The assessment system is a critical informant of the state's accountability measure, the College and Career Ready Performance Index (CCRPI), providing an important gauge about the quality of the educational services and opportunities provided throughout the state. The ultimate goal of Georgia's assessment and accountability system is to ensure that all students are provided the opportunity to engage with high-quality content standards, receive high-quality instruction predicated upon those standards, and are positioned to meet high academic expectations.

Features of the Georgia Milestones Assessment System include:

- technology-enhanced items in English Language Arts and Mathematics (all grades and courses);
- open-ended (constructed-response) items in English Language Arts and Mathematics (all grades and courses);
- a writing component (in response to passages read by students) at every grade level and course within the English Language Arts assessment;
- norm-referenced items in all content areas and courses to complement the criterion-referenced information and to provide a national comparison; and

- a transition to online administration over time, with online administration considered the primary mode of administration and paper/pencil as a backup until the transition is complete.

The primary mode of administration for the Georgia Milestones program is online, with the goal of completing the transition from paper/pencil within five years after the inaugural administration (i.e., the 2014–2015 school year). Paper/pencil test materials (such as Braille) will remain available for students with disabilities who may require them in order to access the assessment.

Georgia Milestones follows guiding principles to help ensure that the assessment system:

- is sufficiently challenging to ensure Georgia students are well positioned to compete with other students across the United States and internationally;
- is intentionally designed across grade levels to send a clear signal of student academic progress and preparedness for the next level, whether it is the next grade level, course, or college or career;
- is accessible to all students, including those with disabilities or limited English proficiency, at all achievement levels;
- supports and informs the state’s educator-effectiveness initiatives, ensuring items and forms are appropriately sensitive to quality instructional practices; and
- accelerates the transition to online administration, allowing—over time—for the inclusion of innovative technology-enhanced items.

GEORGIA MILESTONES END-OF-COURSE (EOC) ASSESSMENTS

As previously mentioned, Georgia law (§20-2-281) mandates that the State Board of Education adopt EOC assessments for core courses to be determined by the Board. An EOC assessment serves as a student’s final exam in the associated course.

With educator input and State Board approval, the Georgia Milestones EOC assessments measure student achievement in the following courses: Ninth Grade Literature and Composition, American Literature and Composition, Algebra I, Geometry, Coordinate Algebra, Analytic Geometry, Physical Science, Biology, United States History, and Economics/Business/Free Enterprise.

Any student enrolled in and/or receiving credit for one of the above-mentioned courses, regardless of grade level, is required to take the Georgia Milestones EOC assessment upon completion of that course. This includes middle school students completing a course associated with a Georgia Milestones EOC assessment, regardless of whether they are receiving high school credit. Students enrolling from non-accredited programs are required to take and pass the Georgia Milestones EOC assessment prior to receiving credit for the course.

A student’s final grade in the course will be calculated using the Georgia Milestones EOC assessment as follows (State Board Rule 160-4-2-.13):

- For students enrolled in Grade 9 for the first time before July 1, 2011, the EOC assessment counts as 15% of the final grade.
- For students enrolled in Grade 9 for the first time on or after July 1, 2011, the EOC assessment counts as 20% of the final grade.

Results of the EOC assessments, according to the legislated and identified purposes, must:

- provide a valid measure of student achievement of the state content standards across the full achievement continuum;
- serve as the final exam for each course, contributing 15% or 20% to the student's final course grade;
- provide a clear signal of each student's preparedness for the next course and ultimately post-secondary endeavors (college and career);
- allow for the detection of the academic progress made by each student from one assessed course to the next;
- support and inform educator-effectiveness measures; and
- inform state and federal accountability measures at the school, district, and state levels.

Additional uses of the EOC assessments include: (1) certifying student proficiency prior to the awarding of credit for students enrolling from non-accredited private schools, home study programs, or other non-traditional educational centers and (2) allowing eligible students to demonstrate competency without taking the course and earn course credit (e.g., "test out"). In both cases, students are allotted *one* administration.

ASSESSMENT GUIDE

The Georgia Milestones Geometry EOC Assessment Guide is provided to acquaint Georgia educators and other stakeholders with the structure of and content assessed by the test. Importantly, this guide is not intended to inform instructional planning. It is essential to note that there are a small number of content standards that are better suited for classroom or individual assessment than for large-scale summative assessment. While those standards are not included in the tests and therefore are not included in this Assessment Guide, the knowledge, concepts, and skills inherent in those standards are often required for the mastery of the standards that are assessed. Failure to attend to all content standards within a course can limit a student's opportunity to learn and show what he or she knows and can do on the assessment.

The Georgia Milestones Geometry EOC Assessment Guide is in *no way* intended to substitute for the state-mandated content standards; it is provided to help educators better understand the structure and content of the assessment, *but it is not all-encompassing of the knowledge, concepts, and skills covered in the course or assessed on the test*. The state-adopted content standards and associated standards-based instructional resources, such as the Content Frameworks, should be used to plan instruction. This Assessment Guide can serve as a *supplement* to those resources, in addition to any locally developed resources, **but should not be used in isolation**. In principle, the Assessment Guide is intended to be descriptive of the assessment program and should not be considered all-inclusive. The state-adopted content standards are located at www.georgiastandards.org.

TESTING SCHEDULE

The Georgia Milestones Geometry EOC assessment is offered during three Main Administrations. Main Administrations are primarily intended to provide an opportunity to assess student achievement at the completion of a course and to serve as the final exam for the associated course as required by State Board Rule. As a result, the EOC assessment should occur as close to the conclusion of the course as possible. Main Administrations can also be utilized to verify credit from a non-accredited school or home schooling. In addition to the Main Administrations, Mid-Month Administrations are provided in order to allow students additional testing opportunities for the various reasons noted below.

Purpose for EOC Assessment	Winter & Spring Main Administrations	Mid-Month Administrations	Summer Main Administration
Completion of Course	Yes	Yes	Yes
Makeup from Previous Administration	Yes	Yes	Yes
Retest	No*	Yes	Yes
Test Out	No	Yes**	Yes
Validation of Credit	Yes	Yes	Yes

*Winter and Spring Main Administrations cannot be used for the purpose of a retest.

**August, September, and March Mid-Month Administrations as well as the Summer Main Administration can be used for the purpose of a test out.

Note: Each district determines a local testing window within the state-designated testing window.

TEST STRUCTURE

DESCRIPTION OF TEST FORMAT AND ORGANIZATION

The Georgia Milestones Geometry EOC assessment is primarily a criterion-referenced test designed to provide information about how well a student has mastered the state-adopted content standards within the course. Each student will receive one of four Achievement Level designations, depending on how well the student has mastered the course content standards. The four Achievement Level designations are Beginning Learner, Developing Learner, Proficient Learner, and Distinguished Learner. In addition to criterion-referenced information, the Georgia Milestones measures will also include a limited sample of nationally norm-referenced items to provide a signal of how Georgia students are achieving relative to their peers nationally. The norm-referenced information provided is supplementary to the criterion-referenced Achievement Level designation and will not be utilized in any manner other than to serve as a barometer of national comparison. Only the criterion-referenced scores and Achievement Level designations will be utilized in the accountability metrics associated with the assessment program (such as student course grades, student growth measures, educator-effectiveness measures, and the CCRPI).

The Geometry EOC assessment consists of both operational items (contribute to a student's criterion-referenced and/or norm-referenced score) and field test items (newly written items that are being tried out and do not contribute to the student's score). A subset of the norm-referenced operational items have been verified as aligned to the course content standards by Georgia educators and will also contribute to the criterion-referenced score and Achievement Level designation. The other norm-referenced items will contribute only to the national percentile rank, which is provided as supplemental information.

With the inclusion of the norm-referenced items, students may encounter items for which they have not received direct instruction. These items will not contribute to the students' criterion-referenced Achievement Level designation; only items that align to the course content standards will contribute to the criterion-referenced score. Students should be instructed to try their best should they ask about an item that is not aligned to the content they have learned as part of the course.

The table on the following page outlines the number and types of items included on the Geometry EOC assessment.

Geometry EOC Assessment Design

Description	Number of Items	Points for CR ¹ Score	Points for NRT ² Feedback
CR Selected-Response Items	38	38	0
NRT Selected-Response Items	20 ³	10 ⁴	20
CR Technology-Enhanced Items	1	2	0
CR Constructed-Response Items	2	4	0
CR Extended Constructed-Response Items	1	4	0
CR Field Test Items	11	0	0
Total Items/Points⁵	73	58	20

¹CR—Criterion-Referenced: items aligned to state-adopted content standards

²NRT—Norm-Referenced Test: items that will yield a national comparison; may or may not be aligned to state-adopted content standards

³Of these items, approximately 10 will contribute to both the CR scores and NRT feedback. The other 10 of these items will contribute to NRT feedback only and will not impact the student's Achievement Level designation, scale score, or grade conversion.

⁴Alignment of national NRT items to course content standards was verified by a committee of Georgia educators. Only approved, aligned NRT items will contribute to a student's CR Achievement Level designation, scale score, and grade conversion score.

⁵Of the 73 total items, 52 items contribute to the CR score, for a total of 58 points; 20 total items contribute to NRT feedback, for a total of 20 points.

The test will be given in two sections. Section 1 is divided into two parts. Students may have up to 85 minutes per section to complete Sections 1 and 2. The total estimated testing time for the Geometry EOC assessment ranges from approximately 120 to 170 minutes. Total testing time describes the amount of time students have to complete the assessment. It does not take into account the time required for the test examiner to complete pre-administration and post-administration activities (such as reading the standardized directions to students). Sections 1 and 2 may be administered on the same day or across two consecutive days based on the district's testing protocols for the EOC measures (in keeping with state guidance).

During the Geometry EOC assessment, a formula sheet will be available for students to use. There is an example of the formula sheet in the Additional Sample Items section of this guide. Another feature of the Geometry EOC assessment is that students may use a graphing calculator in Part B of Section 1 and in all of Section 2.

CONTENT MEASURED

The Geometry EOC assessment will measure the Geometry standards that are described at www.georgiastandards.org.

The content of the assessment is organized into four groupings, or domains, of standards for the purposes of providing feedback on student performance. A content domain is a reporting category that *broadly* describes and defines the content of the course, as measured by the EOC assessment. The standards for Geometry are grouped into four domains: Congruence and Similarity; Circles; Equations and Measurement; and Statistics and Probability. Each domain was created by organizing standards that share similar content characteristics. The content standards describe the level of expertise that Geometry educators should strive to develop in their students. Educators should refer to the content standards for a full understanding of the knowledge, concepts, and skills subject to be assessed on the EOC assessment.

The approximate proportional number of points associated with each domain is shown in the following table. A range of cognitive levels will be represented on the Geometry EOC assessment. Educators should always use the content standards when planning instruction.

Geometry: Domain Structures and Content Weights

Domain	Standard		Approximate Weight
Congruence and Similarity	MGSE9-12G.C.01 MGSE9-12G.C.02 MGSE9-12G.C.03 MGSE9-12G.C.04 MGSE9-12G.C.05 MGSE9-12G.C.0.6 MGSE9-12G.C.0.7 MGSE9-12G.C.0.8 MGSE9-12G.C.0.9	MGSE9-12.C.0.10 MGSE9-12.C.0.11 MGSE9-12.C.0.12 MGSE9-12.C.0.13 MGSE9-12.SRT.1 MGSE9-12.SRT.2 MGSE9-12.SRT.3 MGSE9-12.SRT.4 MGSE9-12.SRT.5	35%
Circles	MGSE9-12.C.1 MGSE9-12.C.2 MGSE9-12.C.3	MGSE9-12.C.4 MGSE9-12.C.5 MGSE9-12.GPE.1	15%
Equations and Measurement	MGSE9-12.GPE.4 MGSE9-12.GPE.5 MGSE9-12.GPE.6 MGSE9-12.GPE.7 MGSE9-12.G.MD.1 MGSE9-12.G.MD.2 MGSE9-12.G.MD.3 MGSE9-12.G.MD.4	MGSE9-12.G.MG.1 MGSE9-12.G.MG.2 MGSE9-12.G.MG.3 MGSE9-12.SRT.6 MGSE9-12.SRT.7 MGSE9-12.SRT.8	35%
Statistics and Probability	MGSE9-12S.CP.1 MGSE9-12S.CP.2 MGSE9-12S.CP.3	MGSE9-12S.CP.4 MGSE9-12S.CP.5 MGSE9-12S.CP.6 MGSE9-12S.CP.7	15%

ITEM TYPES

The Geometry EOC assessment consists of selected-response, technology-enhanced, constructed-response, extended constructed-response, and extended writing-response items.

A selected-response item, sometimes called a multiple-choice item, is defined as a question, problem, or statement that appears on a test followed by several answer choices, sometimes called options or response choices. The incorrect choices, called distractors, usually reflect common errors. The student's task is to choose, from the alternatives provided, the best answer to the question posed in the stem (the question). The Geometry selected-response items will have four answer choices. All norm-referenced items will be selected-response.

A technology-enhanced item is an innovative way to measure student skills and knowledge using scaffolding within a multi-step process. For Geometry there are two specific types of technology-enhanced items being used—a multiple-select item and a multiple-part item. In multiple-select items, the student is asked to pick two or three correct responses from five or six possible answer options. In multiple-part items, the student responds to a two-part item that combines multiple-choice and/or multiple-select. For these item types, the student selects the responses from the choices provided or writes a response. A student receives two points for selecting all correct answers or partial credit is awarded for special combinations.

A constructed-response item asks a question and solicits the student to provide a response he or she constructs on his or her own, as opposed to selecting from options provided. The constructed-response items on the EOC assessments will be worth two points. Partial credit may be awarded if part of the response is correct.

An extended constructed-response item is a specific type of constructed-response item that elicits a longer, more detailed response from the student than a two-point constructed-response item does. The extended constructed-response items on the EOC assessments will be worth four points. Partial credit may be awarded if part of the response is correct.

DEPTH OF KNOWLEDGE DESCRIPTORS

Items found on the Georgia Milestones assessments, including the Geometry EOC assessment, are developed with a particular emphasis on cognitive complexity or Depth of Knowledge (DOK). DOK is measured on a scale of 1 to 4 and refers to the level of cognitive demand required to complete a task (or in this case, an assessment item). The higher the level, the *more complex* the item; however, higher levels do not necessarily mean *more difficult* items. For instance, a question can have a low DOK but a medium or even high difficulty level. Conversely, a DOK 4 question may have a low difficulty level but still require a great deal of cognitive thinking (e.g., analyzing and synthesizing information instead of just recalling it). The following descriptions and table show the expectations of the four DOK levels in greater detail.

Level 1 (Recall of Information) generally requires students to identify, list, or define, often asking them to recall who, what, when, and where. Consequently, this level usually asks students to recall facts, terms, concepts, and trends and may ask them to identify specific information contained in documents, excerpts, quotations, maps, charts, tables, graphs, or illustrations. Items that require students to “describe” and/or “explain” could be classified at Level 1 or Level 2, depending on what is to be described and/or explained. A Level 1 “describe” and/or “explain” would require students to recall, recite, or reproduce information.

Level 2 (Basic Reasoning) includes the engagement of some mental processing beyond recalling or reproducing a response. A Level 2 “describe” and/or “explain” would require students to go beyond a description or explanation of recalled information to describe and/or explain a result or “how” or “why.”

Level 3 (Complex Reasoning) requires reasoning, using evidence, and thinking on a higher and more abstract level than Level 1 and Level 2. Students will go beyond explaining or describing “how and why” to justifying the “how and why” through application and evidence. Level 3 questions often involve making connections across time and place to explain a concept or “big idea.”

Level 4 (Extended Reasoning) requires the complex reasoning of Level 3 with the addition of planning, investigating, applying significant conceptual understanding, and/or developing that will most likely require an extended period of time. Students should be required to connect and relate ideas and concepts *within* the content area or *among* content areas in order to be at this highest level. The distinguishing factor for Level 4 would be a show of evidence (through a task, a product, or an extended response) that the cognitive demands have been met.

The following table identifies skills that students will need to demonstrate at each DOK level, along with question cues appropriate for each level.

Level	Skills Demonstrated	Question Cues
<p style="text-align: center;">Level 1 Recall of Information</p>	<ul style="list-style-type: none"> • Make observations • Recall information • Recognize formulas, properties, patterns, processes • Know vocabulary, definitions • Know basic concepts • Perform one-step processes • Translate from one representation to another • Identify relationships 	<ul style="list-style-type: none"> • Find • List • Define • Identify; label; name • Choose; select • Compute; estimate • Express • Read from data displays • Order
<p style="text-align: center;">Level 2 Basic Reasoning</p>	<ul style="list-style-type: none"> • Apply learned information to abstract and real-life situations • Use methods, concepts, theories in abstract and real-life situations • Perform multi-step processes • Solve problems using required skills or knowledge (requires more than habitual response) • Make a decision about how to proceed • Identify and organize components of a whole • Extend patterns • Identify/describe cause and effect • Recognize unstated assumptions, make inferences • Interpret facts • Compare or contrast simple concepts/ideas 	<ul style="list-style-type: none"> • Apply • Calculate; solve • Complete • Describe • Explain how; demonstrate • Construct data displays • Construct; draw • Analyze • Extend • Connect • Classify • Arrange • Compare; contrast

Level	Skills Demonstrated	Question Cues
<p style="text-align: center;">Level 3 Complex Reasoning</p>	<ul style="list-style-type: none"> • Solve an open-ended problem with more than one correct answer • Create a pattern • Relate knowledge from several sources • Draw conclusions • Make predictions • Translate knowledge into new contexts • Assess value of methods, concepts, theories, processes, formulas • Make choices based on a reasoned argument • Verify the value of evidence, information, numbers, data 	<ul style="list-style-type: none"> • Plan; prepare • Predict • Create; design • Generalize • Justify; explain why; support; convince • Assess • Rank; grade • Test; judge • Recommend • Select • Conclude
<p style="text-align: center;">Level 4 Extended Reasoning</p>	<ul style="list-style-type: none"> • Analyze and synthesize information from multiple sources • Apply mathematical models to illuminate a problem or situation • Design a mathematical model to inform and solve a practical or abstract situation • Combine and synthesize ideas into new concepts 	<ul style="list-style-type: none"> • Design • Connect • Synthesize • Apply concepts • Analyze • Create • Prove

SCORES

Selected-response items and technology-enhanced items are machine scored. However, the Geometry EOC assessment consists of selected-response, technology-enhanced, constructed-response, and extended constructed-response items. Items that are not machine scored—i.e., constructed-response, extended constructed-response, and extended writing-response items—require rubrics for manual scoring.

Students will receive a scale score and an Achievement Level designation based on total test performance. In addition, students will receive information on how well they performed at the domain level. Students will also receive a norm-referenced score based on a set of norm-referenced items included within the test; this score will allow comparison to a national norming group of students.

EXAMPLE ITEMS

Example items, which are representative of the applicable DOK levels across various Geometry content domains, are provided.

All example and sample items contained in this guide are the property of the Georgia Department of Education.

Example Item 1

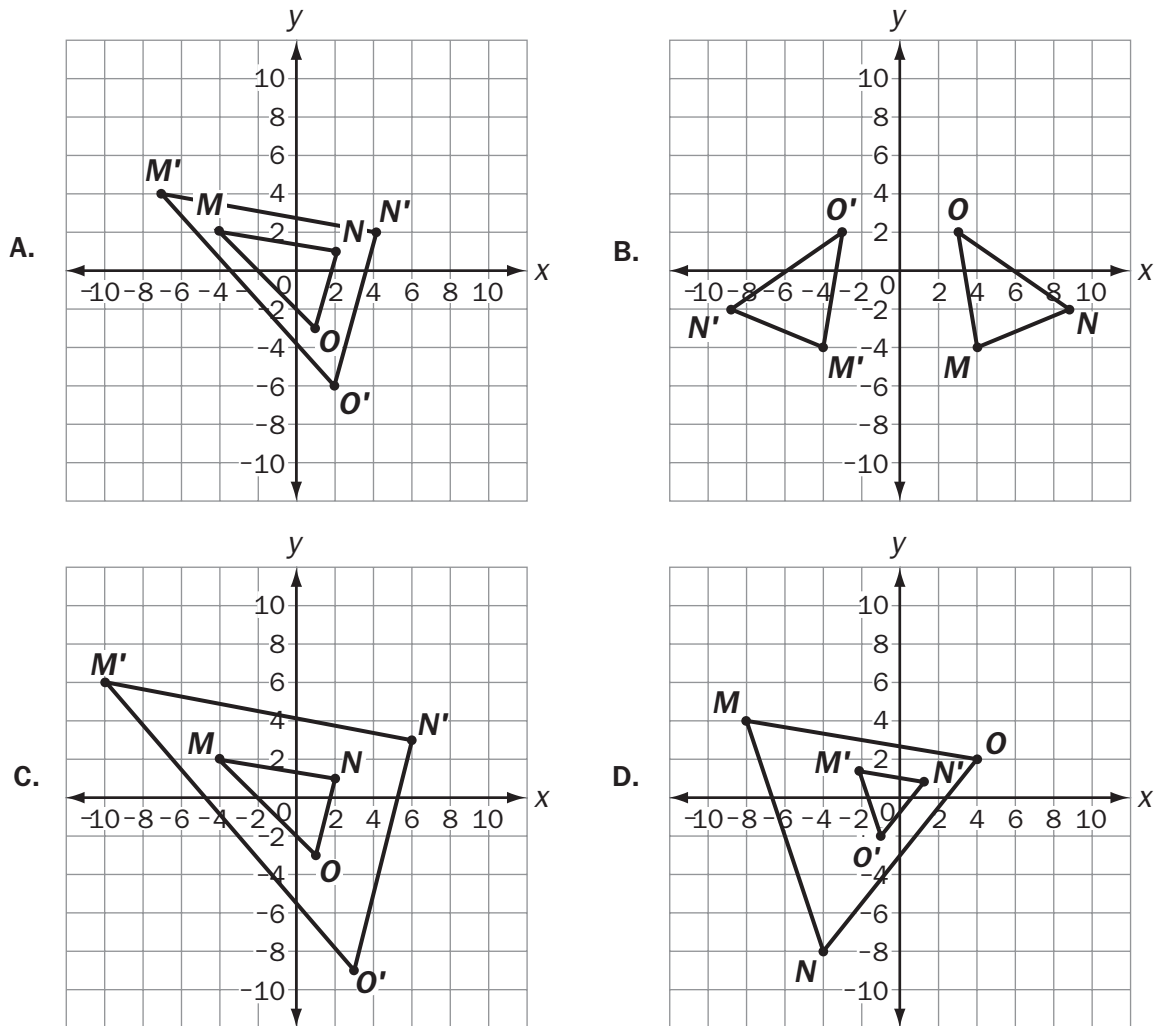
Selected-Response: 1 point

DOK Level 1:

Geometry Content Domain: Geometry

Standard: MGSE9-12.G.CO.6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

Which transformation of $\triangle MNO$ results in a congruent triangle?



Correct Answer: B

Explanation of Correct Answer: The correct answer is choice (B). Choice (B) shows triangle MNO reflected across the y -axis, which is a rigid transformation that maintains congruency. Choices (A), (C), and (D) are incorrect because one of the triangles is contained entirely within the other triangle, so they cannot be congruent to each other.

Example Item 2

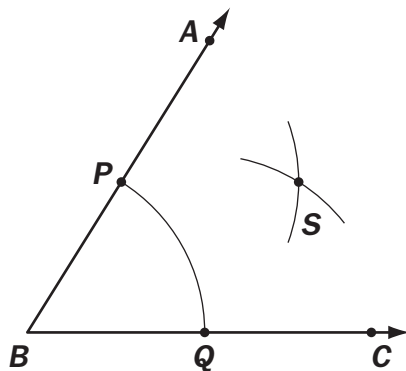
Selected-Response: 1 point

DOK Level 2:

Geometry Content Domain: Geometry

Standard: MGSE9-12G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

A student used a compass and a straightedge to bisect $\angle ABC$ in this figure.



Which statement **BEST** describes point S ?

- A. Point S is located such that $SC = PQ$.
- B. Point S is located such that $SA = PQ$.
- C. Point S is located such that $PS = BQ$.
- D. Point S is located such that $QS = PS$.

Correct Answer: D

Explanation of Correct Answer: The correct answer is choice (D) Point S is located such that $QS = PS$. Point S was constructed by placing a compass with a set radius at points P and Q . Therefore, PS and QS are both equal to the radius of the compass and equal to each other. Choices (A), (B), and (C) are incorrect because they identify incorrect line segments in the construction as congruent.

Example Item 3

Selected-Response: 1 point

DOK Level 3:

Geometry Content Domain: Geometry

Standard: MGSE9-12 G.CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

Rectangle $ABCD$ has points $A(2, 2)$, $B(6, 2)$, $C(6, 8)$, and $D(2, 8)$. The rectangle maps to $A'B'C'D'$ such that $(x, y) \rightarrow (y, -x)$.

Which statement is true about the transformation of $ABCD$ to $A'B'C'D'$?

- A. $ABCD$ maps to $A'B'C'D'$ by a reflection over the x -axis and B' is located at $(2, -6)$.
- B. $ABCD$ maps to $A'B'C'D'$ by a reflection over the x -axis and B' is located at $(6, -2)$.
- C. $ABCD$ maps to $A'B'C'D'$ by a 90 degree clockwise rotation about the origin and B' is located at $(2, -6)$.
- D. $ABCD$ maps to $A'B'C'D'$ by a 90 degree clockwise rotation about the origin and B' is located at $(6, -2)$.

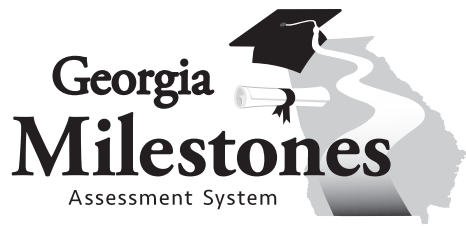
Correct Answer: C

Explanation of Correct Answer: The correct answer is choice (C) $ABCD$ maps to $A'B'C'D'$ by a 90 degree clockwise rotation about the origin and B' is located at $(2, -6)$. Choices (A) and (B) are incorrect because the given transformation is a rotation of 90 degrees clockwise, not a reflection over the x -axis. Choice (D) is incorrect because the location of $(6, -2)$ would be the result of a reflection over the x -axis.

ADDITIONAL SAMPLE ITEMS

This section has two parts. The first part is a set of 13 sample items for Geometry. The second part contains a table that shows for each item the standard assessed, the DOK level, the correct answer (key), and a rationale/explanation about the key and distractors. The sample items can be utilized as a mini-test to familiarize students with the item formats found on the assessment.

All example and sample items contained in this guide are the property of the Georgia Department of Education.



Geometry Formula Sheet

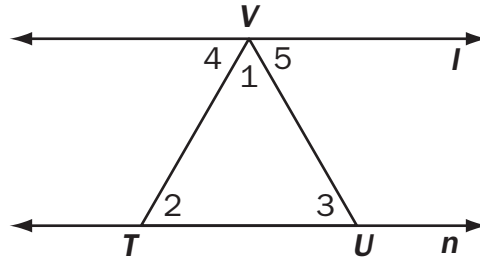
You can find mathematics formula sheets on the Georgia Milestones webpage at <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-Assessment-System.aspx>.

Look under “EOC Resources.”

Item 1

Selected-Response: 1 point

In this figure, $l \parallel n$. Jessie listed the first two steps in a proof that shows $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$.



	Step	Justification
1	$\angle 2 \cong \angle 4$?
2	$\angle 3 \cong \angle 5$?

Which justification can Jessie give for Steps 1 and 2?

- A. Alternate interior angles are congruent.
- B. Corresponding angles are congruent.
- C. Vertical angles are congruent.
- D. Alternate exterior angles are congruent.

Item 2

Selected-Response: 1 point

The points $O(-4, 3)$, $A(x, y)$, and $B(x, 3)$ create a right triangle inside of Circle O . Point A lies on the circle. $OA = 6$ centimeters.

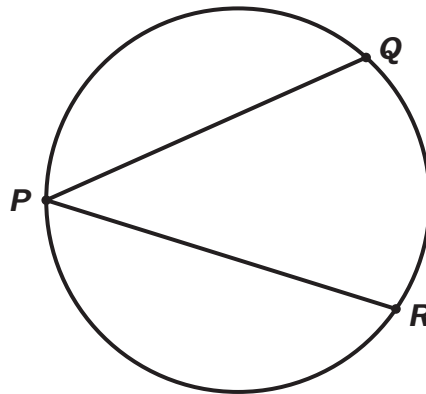
What is the equation of Circle O ?

- A. $(x + 4)^2 + (y - 3)^2 = 6$
- B. $(x - 3)^2 + (y - 3)^2 = 6$
- C. $(x - 3)^2 + (y + 4)^2 = 36$
- D. $(x + 4)^2 + (y - 3)^2 = 36$

Item 3

Selected-Response: 1 point

In this circle, $m\widehat{QR} = 72^\circ$.



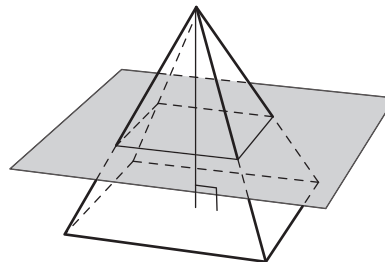
What is $m\angle QPR$?

- A. 18°
- B. 24°
- C. 36°
- D. 72°

Item 4

Selected-Response: 1 point

Look at the square pyramid.



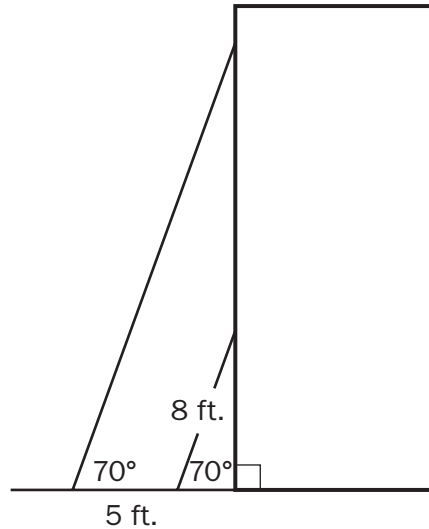
If the plane in the figure is parallel to the base of the pyramid, which BEST describes the shape of the intersection?

- A. a rectangle
- B. a trapezoid
- C. a triangle
- D. a circle

Item 5**Selected-Response:** 1 point

This diagram shows two ladders leaning against a building. Each ladder is leaning at an angle of 70 degrees.

- The length of the short ladder is 8 feet.
- The base of the long ladder is 5 feet farther from the base of the building than the base of the short ladder is.



What is the length, to the nearest foot, of the long ladder?

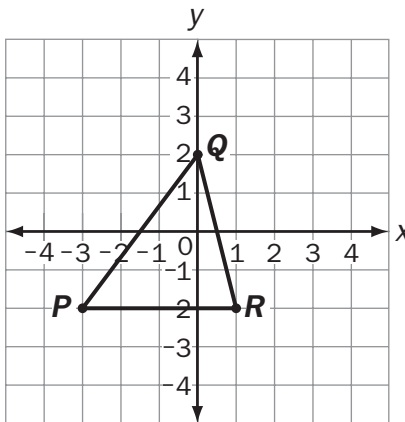
$$\begin{bmatrix} \sin 70^\circ = 0.9397 \\ \cos 70^\circ = 0.3420 \\ \tan 70^\circ = 2.7475 \end{bmatrix}$$

- A. 10 ft.
- B. 13 ft.
- C. 23 ft.
- D. 26 ft.

Item 6

Selected-Response: 1 point

Look at the coordinate grid below.



What is the perimeter of $\triangle PQR$?

- A. $4 + \sqrt{42}$
- B. 14
- C. $9 + \sqrt{17}$
- D. 17

Item 7

Selected-Response: 1 point

Look at the coordinates of square $ABCD$.

- $A(-3, 0)$
- $B(2, 4)$
- $C(6, -1)$
- $D(1, -5)$

What is the perimeter of square $ABCD$?

- A. 20 units
- B. $4\sqrt{41}$ units
- C. $2\sqrt{82}$ units
- D. 41 units

Item 8

Selected-Response: 1 point

Paul has a spinner with the colors red, green, blue, orange, and purple on it. He also has a six-sided number cube.

The probability of the arrow of the spinner stopping on green is $\frac{1}{5}$ and the probability of getting a number greater than 2 when tossing the number cube is $\frac{4}{6}$.

What is the probability of landing on green and tossing a number greater than 2?

- A. $\frac{2}{15}$
- B. $\frac{3}{10}$
- C. $\frac{7}{10}$
- D. $\frac{13}{15}$

Item 9

Technology-Enhanced: 2 points

Triangle ABC is similar but not congruent to triangle DEF .

Part A

Which series of transformations could map triangle ABC onto triangle DEF ?

- A. translation 4 units up, rotation 75° about the origin
- B. reflection across the line $y = 2$, rotation 90° about the origin
- C. translation 3 units left, dilation of scale factor 2 centered at the origin
- D. reflection across the line $x = 1$, reflection across the line $y = 5$

Part B

Which equation must be true about triangle ABC and triangle DEF ?

- A. $AB = DE$
- B. $AC = EF$
- C. $m\angle A + m\angle B = m\angle D + m\angle F$
- D. $m\angle A + m\angle C = m\angle D + m\angle F$

Item 10**Technology-Enhanced:** 2 points

Triangle GHI is a right triangle. Angle G has a measure of g° , angle H has a measure of h° , and angle I is a right angle.

Part A

Select TWO equations that must be true.

- A. $\sin(h^\circ) = \sin(g^\circ)$
- B. $\cos(g^\circ) = \sin(h^\circ)$
- C. $\cos(h^\circ) = \cos(g^\circ)$
- D. $\sin(h^\circ) + \cos(h^\circ) = \sin(g^\circ) + \cos(g^\circ)$
- E. $\sin(g^\circ) + \cos(h^\circ) = \cos(g^\circ) + \sin(h^\circ)$

Part B

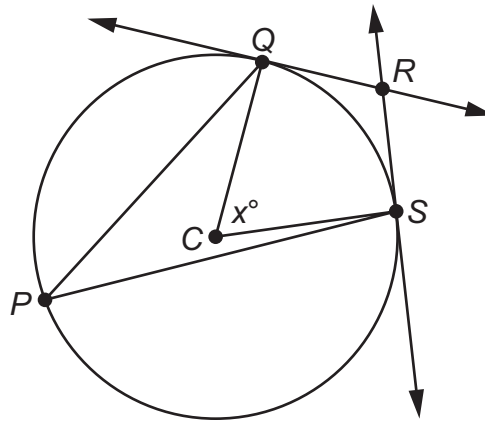
Given that $\tan(g^\circ) = \frac{\sin(g^\circ)}{\cos(g^\circ)}$, which ratio must have a value equivalent to the tangent of g° ?

- A. $\frac{\cos(h^\circ)}{\sin(g^\circ)}$
- B. $\frac{\cos(h^\circ)}{\sin(h^\circ)}$
- C. $\frac{\sin(h^\circ)}{\cos(h^\circ)}$
- D. $\frac{\sin(h^\circ)}{\cos(g^\circ)}$

Item 11

Technology-Enhanced: 2 points

The figure shows circle C with tangent lines \overleftrightarrow{QR} and \overleftrightarrow{SR} .



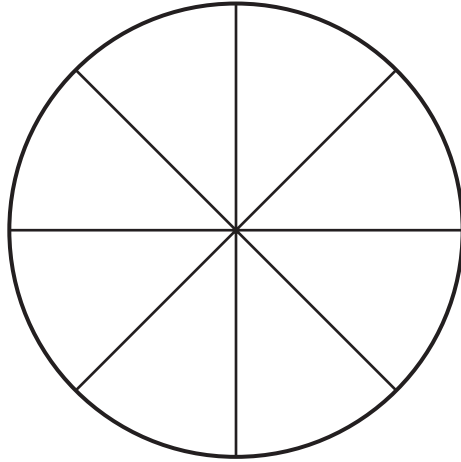
The measure of $\angle QCS$ is x° .

Select **THREE** statements that are true about the figure.

- A. The measure of $\angle QPS$ is $(90 - x)^\circ$.
- B. The measure of $\angle QPS$ is $\frac{1}{2}x^\circ$.
- C. The measure of $\angle PSR$ is 90° .
- D. The measure of $\angle CQR$ is 90° .
- E. The measure of $\angle QRS$ is $(180 - x)^\circ$.
- F. The measure of $\angle QRS$ is $2x^\circ$.

Item 12**Constructed-Response:** 2 points

Billy is creating a circular garden divided into 8 equal sections. The diameter of the garden is 12 feet.



What is the area, in square feet, of one section of the garden? Use $\pi = 3.14$.
Explain how you determined your answer. Write your answer on the lines provided.

Item 13

Extended Constructed-Response: 2 points

Jane and Mark each build ramps to jump their remote-controlled cars.

Both ramps are right triangles when viewed from the side. The incline of Jane's ramp makes a 30-degree angle with the ground, and the length of the inclined ramp is 14 inches. The incline of Mark's ramp makes a 45-degree angle with the ground, and the length of the inclined ramp is 10 inches.

Part A: What is the horizontal length of the base of each ramp? Explain how you found your answers. Write your answers on the lines provided.

$$\left[\begin{array}{ll} \sin 30^\circ = 0.5000 & \sin 45^\circ = 0.7071 \\ \cos 30^\circ = 0.8660 & \cos 45^\circ = 0.7071 \\ \tan 30^\circ = 0.5774 & \tan 45^\circ = 1.0000 \end{array} \right]$$

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Part B: Which car is launched from the highest point? Explain your reasoning. Write your answer on the lines provided.

A large rectangular box containing 15 horizontal lines for writing an answer.

ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
1	MGSE9-12G.CO.10	2	A	The correct answer is (A) because each line is an example of alternate interior angles being congruent. Choice (B) is incorrect because the angles shown are not corresponding angles. Choice (C) is incorrect because the angles shown are not vertical angles. Choice (D) is incorrect because the angles shown are not alternate exterior angles.
2	MGSE9-12A.GPE.1	3	D	The correct answer is choice (D). Choice (A) is incorrect because the radius is not squared. Choice (B) is incorrect because it uses the wrong coordinate for the x -value and does not square the radius. Choice (C) is incorrect because it confuses the x - and y -coordinates
3	MGSE9-12G.C.2	1	C	The correct answer is choice (C) because an inscribed angle is one-half the measure of the arc it creates. Choice (A) is incorrect because it is one-quarter the measure of the arc it creates. Choice (B) is incorrect because it is one-third the measure of the arc it creates. Choice (D) is incorrect because it is the full measure of the arc it creates.
4	MGSE9-12 G.GMD.04	2	A	The correct answer is choice (A) because a rectangle is the correct cross-section. Choices (B), (C), and (D) are incorrect because they represent the incorrect cross-sections.
5	MGSE9-12G.SRT.8	3	C	The correct answer is choice (C) 23 ft. The ratio of the distance from the short ladder to the wall to the length of the short ladder is equal to the cosine of the angle the ladder forms with the ground. So, the short ladder is $8\cos(70^\circ) = 2.736$ feet from the wall, and the long ladder is 7.736 feet from the wall. Similarly, the ratio of the distance from the long ladder to the wall to the length of the long ladder is equal to the cosine of the angle the ladder forms with the wall. So, the long ladder is $7.736/\cos(70^\circ) \approx 22.62$ feet. Choice (B) is incorrect because it is the sum of the lengths in the figure. Choices (A) and (D) are incorrect because they use incorrect trigonometric ratios.
6	MGSE9-12G.MG.3	2	C	The correct answer is choice (C) because $PQ = \sqrt{3^2 + 4^2} = 5$, $QR = \sqrt{1^2 + 4^2} = \sqrt{17}$, and $RP = 4$. Choice (A) incorrectly applies the Pythagorean theorem. Choices (B) and (D) are incorrect because they estimate the lengths without the Pythagorean theorem.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
7	MGSE9-12G.GPE.7	2	B	The correct answer is choice (B) $4\sqrt{41}$ units. Apply the distance formula to find the length of one side, which is $\sqrt{41}$. Since this is a square, multiply $\sqrt{41}$ by 4 to obtain the perimeter. Choice (A) is incorrect because the number of unit squares on a line segment were counted to estimate the length and then multiplied by 4. Choice (C) is incorrect because the length of the diagonal is multiplied by 2. Choice (D) is incorrect because it is the approximate area of the square.
8	MGSE9-12S.CP.2	2	A	The correct answer is choice (A). The student multiplied the probabilities of the two independent events. The student divided the probabilities in (B) and in (C) the complement of the probability from (B) was given. The probabilities were added in (D).
9	GSE-1: G.SRT.5	2	Part A: C Part B: D	See scoring rubric on page 34.
10	GSE-1: G.SRT.7	2	Part A: B/D Part B: B	See scoring rubric on page 35.
11	GSE-1: G.C.2	3	B/D/E	See scoring rubric on page 36.
12	MGSE9-12G.C.5	2	N/A	See scoring rubric and exemplar responses on page 37.
13	MGSE9-12G.SRT.8	3	N/A	See scoring rubric and exemplar responses beginning on page 38.

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES**Item 9****Scoring Rubric**

Points	Description
2	<p>The response achieves the following: A score of 2 indicates complete understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p> <ul style="list-style-type: none">• The student determines that the correct answer for Part A is Choice (C). AND• The student determines that the correct answer for Part B is Choice (D).
1	<p>The response achieves the following: A score of 1 indicates a partial understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p> <ul style="list-style-type: none">• The student determines that the correct answer for Part A is Choice (C). OR• The student determines that the correct answer for Part B is Choice (D).
0	<p>The response achieves the following: A score of 0 indicates limited to no understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p>

Item 10

Scoring Rubric

Points	Description
2	<p>The response achieves the following: A score of 2 indicates a complete understanding of how to explain and use the relationship between the sine and cosine of complementary angles.</p> <ul style="list-style-type: none"> • The student determines that the correct answers for Part A are Choice (B) and Choice (D). <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • The student determines that the correct answer for Part B is Choice (B).
1	<p>The response achieves the following: A score of 1 indicates a partial understanding of how to explain and use the relationship between the sine and cosine of complementary angles.</p> <ul style="list-style-type: none"> • The student determines that the correct answers for Part A are Choice (B) and Choice (D). <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • The student determines that the correct answer for Part B is Choice (B).
0	<p>The response achieves the following: A score of 0 indicates limited to no understanding of how to explain and use the relationship between the sine and cosine of complementary angles.</p>

Item 11

Scoring Rubric

Points	Description
2	<p>The response achieves the following: A score of 2 indicates complete understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <ul style="list-style-type: none"> • The student selects Choice (B), Choice (D), and Choice (E).
1	<p>The response achieves the following: A score of 1 indicates a partial understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <ul style="list-style-type: none"> • The student selects Choice (B) and Choice (D), with or without an additional incorrect answer. OR • The student selects Choice (D) and Choice (E), with or without an additional incorrect answer. OR • The student selects Choice (B) and Choice (E), with or without an additional incorrect answer.
0	<p>The response achieves the following: A score of 0 indicates limited to no understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <ul style="list-style-type: none"> • The student selects Choice (B), with or without any additional incorrect answers. OR • The student selects Choice (D), with or without any additional incorrect answers. OR • The student selects Choice (E), with or without any additional incorrect answers. OR • The student does not select any correct answers.

Item 12

Scoring Rubric

Points	Description
2	<p>The response achieves the following: Student demonstrates full understanding of deriving the area of a sector of a circle. Award 2 points for a student response that contains both the following elements:</p> <ul style="list-style-type: none"> • An explanation of a valid process for determining the area of one section of the garden • A final answer of 4.5π or 14.13 feet^2
1	<p>The response achieves the following: Student shows partial understanding of deriving the area of a sector of a circle. Award 1 point for a student response that contains only one of the following elements:</p> <ul style="list-style-type: none"> • An explanation of a valid process for determining the area of one section of the garden • A final answer of 4.5π or 14.13 feet^2
0	<p>The response achieves the following: Student demonstrates little to no understanding of deriving the area of a sector of a circle.</p>

Exemplar Response

Points Awarded	Sample Response
2	I can find the area of the entire circle and divide by 8. This equals 4.5π .
1	$4.5\pi \text{ feet}^2$
0	<i>Student does not produce a correct response or a correct process.</i>

Item 13

Scoring Rubric

Points	Description
4	<p>The response achieves the following: Response demonstrates a complete understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 4 points for correct responses to both Part A and Part B with valid work shown.</p> <p>Scoring Note: There are other valid ways of solving. Accept any valid method.</p>
3	<p>The response achieves the following: Response demonstrates a nearly complete understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 3 points for correct responses to both Part A and Part B with valid work shown for only 1 part.</p> <p>Scoring Note: There are other valid ways of solving. Accept any valid method.</p>
2	<p>The response achieves the following: Response demonstrates a partial understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 2 points for any of the following response types:</p> <ul style="list-style-type: none"> • Correct responses to both Part A and Part B with no valid work shown • Correct response for Part A with valid work shown with no correct work in Part B • Correct response for Part B with valid work shown with no correct work in Part A (Incorrect results in Part A can be used in a correct method in Part B.) <p>Scoring Note: There are other valid ways of solving. Accept any valid method.</p>
1	<p>The response achieves the following: Response demonstrates a minimal understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 1 point for either of the following:</p> <ul style="list-style-type: none"> • Correct response to either Part A or Part B with no valid work shown for either • Correct method to one part shown, but it contains a computational error that results in an incorrect solution <p>Scoring Note: There are other valid ways of solving. Accept any valid method.</p>
0	<p>The response achieves the following: Response demonstrates no understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems.</p>

Exemplar Response

Points Awarded	Sample Response
4	Part A: Jane's ramp's horizontal length: $14\cos(30) = 12.12$ inches Mark's ramp's horizontal length: $10\cos(45) = 7.1$ inches Part B: Jane's car is launched from $14\sin(30) = 7$ inches Mark's car is launched from $10\sin(45) = 7.1$ inches So, Mark's car is launched from a higher point.
3	Part A: Jane's ramp's horizontal length = $14\cos(30) = 12.1$ inches and Mark's ramp = $10\cos(45) = 7.1$ inches Part B: Mark's car is launched from a higher point.
2	Part A: Jane's ramp's horizontal length = 12.1 inches and Mark's ramp = 7.1 inches Part B: Mark's car is launched from a higher point.
1	Part A: Jane's ramp's horizontal length = 12.1 inches and Mark's ramp = 7.1 inches
0	<i>Student does not produce a correct response or a correct process.</i>

Assessment Guide
Geometry
End-of-Course

