

Georgia Milestones

Assessment System



Assessment Guide Analytic 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 all grades and courses;
- open-ended (constructed-response) items in English Language Arts (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; 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 Analytic 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 Analytic 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 Analytic 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 Analytic Geometry EOC assessment is a criterion-referenced test designed to provide information about how well a student has mastered the state-adopted content standards within the course. The assessment consists of both operational items and field test items (newly written items that are being tried out and do not contribute to the student's score). Each student will receive one of four Achievement Level designations, depending on how well the student has mastered the 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 produce an estimate 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 growth measures, educator-effectiveness measures, or the CCRPI).

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

Analytic Geometry EOC Assessment Design

Description	Number of Items	Number of Points
1-point Selected-Response and Technology-Enhanced Items ^{1, 2}	42	42
2-point Technology-Enhanced Items ¹	8	16
Field Test Items ³	5	0
Total⁴	55	58

¹ **Technology-Enhanced:** Possible variants of the technology-enhanced item types used for Mathematics include multiple-part selected-response, multiple-select, drag-and-drop, drop-down, graphing, and keypad-input.

² **1-point Selected-Response and Technology-Enhanced Items:** The ratio of selected-response to technology-enhanced items may vary. The target range of 1-point technology-enhanced items is 0 to 5.

³ **Field Test Items:** Field test items may include 1-point selected-response, 1-point technology-enhanced, and 2-point technology-enhanced items.

⁴ **Total:** Of the total 55 items, 50 contribute to the student’s Mathematics score.

The test will be given in two sections. Section 1 is divided into two parts. Students may have up to 65 minutes per section to complete Sections 1 and 2. The total estimated testing time for the Analytic Geometry EOC assessment ranges from approximately 60 to 130 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 Analytic 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 Analytic 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 Analytic Geometry EOC assessment will measure the Analytic Geometry standards that are described at www.georgiastandards.org.

The content of the assessment is organized into five 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 Analytic Geometry are grouped into five domains: Congruence and Similarity; Circles; Equations and Measurement; Expressions, Equations, and Functions (*including Number*); 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 Analytic 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 Analytic Geometry EOC assessment. Educators should always use the content standards when planning instruction.

Analytic Geometry: Domain Structures and Content Weights
Reporting Categories and Content Standards

Reporting Category/Domain	Content Standards Assessed	Approximate # of Points	Approximate % of Test
Congruence and Similarity	MGSE9-12.G.CO (6, 7, 8, 9, 10, 11, 12, 13)	17	30%
	MGSE9-12.G.SRT (1, 2, 3, 4, 5)		
Circles	MGSE9-12.G.C (1, 2, 3, 4, 5)	9	15%
	MGSE9-12.G.GPE (1)		
Equations and Measurement	MGSE9-12.G.GMD (1, 2, 3, 4)	9	15%
	MGSE9-12.G.MG (1, 2, 3)		
	MGSE9-12.G.GPE (4)		
	MGSE9-12.G.SRT (6, 7, 8)		

Reporting Category/Domain	Content Standards Assessed	Approximate # of Points	Approximate % of Test
Expressions, Equations, and Functions <i>(including Number)</i>	MGSE9-12.A.SSE (1, 1a, 1b, 2, 3, 3a, 3b)	16	28%
	MGSE9-12.A.APR (1)		
	MGSE9-12.A.CED (1, 2, 4)		
	MGSE9-12.A.REI (4, 4a, 4b)		
	MGSE9-12.F.IF (4, 5, 6, 7, 7a, 8, 8a, 9)		
	MGSE9-12.F.BF (1, 1a, 3)		
	MGSE9-12.F.LE (3)		
	MGSE9-12.N.RN (2, 3)		
Statistics and Probability	MGSE9-12.S.ID (6, 6a)	7	12%
	MGSE9-12.S.CP (1, 2, 3, 4, 5, 6, 7)		
Total		58	100%

The Standards for Mathematical Practice (1–8) will be embedded within items aligned to the mathematical content standards.

ITEM TYPES

The Analytic Geometry EOC assessment consists of selected-response and technology-enhanced items.

A selected-response item, sometimes called a multiple-choice item, is defined as a question, problem, or statement that is 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 choices provided, the best answer to the question (the stem). The Analytic Geometry selected-response items will have four answer choices.

A technology-enhanced item is an innovative way to measure student skills and knowledge by using scaffolding within a multi-step process. Technology-enhanced items are worth one or two points. If the item is worth two points, partial credit is awarded for special combinations of responses that do not include all the correct answers. For Analytic Geometry, there are a number of specific technology-enhanced item types being used:

- In multi-select items, the student is asked to pick two or three correct responses from five or six answer options.
- In multi-part items, the student responds to a question, statement, or prompt that has two or more parts.
- In drag-and-drop items, the student uses a mouse, touchpad, or touchscreen to move responses to designated areas on the screen.

- In drop-down menu items, the student uses a mouse, touchpad, or touchscreen to open a drop-down menu and select an option from the menu. A drop-down menu item may have multiple drop-down menus.
- In keypad-input items, the student uses the physical keyboard or the pop-up keyboard on a touchscreen to type a number, expression, or equation into an answer box.
- In coordinate-graph items, the student uses a mouse, touchpad, or touchscreen to draw lines and/or plot points on a coordinate grid on the screen.
- In line-plot items, the student uses a mouse, touchpad, or touchscreen to place Xs above a number line to create a line plot.
- In bar-graph items, the student uses a mouse, touchpad, or touchscreen to select the height of each bar to create a bar graph.
- In number-line items, the student uses a mouse, touchpad, or touchscreen to plot a point and/or represent inequalities.
- Since some technology-enhanced items in this guide were designed to be used only in an online, interactive-delivery format, some of the item-level directions will not appear to be applicable when working within the format presented in this document (for example, “Move the clocks into the graph” or “Create a scatter plot”).
- This icon  identifies special directions that will help the student answer technology-enhanced items as shown in the format presented within this guide. These directions do not appear in the online version of the test but explain information about how the item works that would be easily identifiable if the student were completing the item in an online environment.

To give students practice using technology-enhanced items in an online environment very similar to how they will appear on the online test, visit “Experience Online Testing Georgia.”

1. Go to the website “Welcome to Experience Online Testing Georgia” (<http://gaexperienceonline.com/>).
2. Select “Test Practice.”
3. Under “End-of-Course (EOC) All Assessments,” select “Online Tools Training.”
4. Select “EOC Test Practice.”
5. Select “Technology Enhanced Items.”
6. You will be taken to a login screen. Use the username and password provided on the screen to log in and practice navigating technology-enhanced items online.

Please note that Google Chrome is the only supported browser for this public version of the online testing environment.

DEPTH OF KNOWLEDGE DESCRIPTORS

Items found on the Georgia Milestones assessments, including the Analytic 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>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>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 Analytic Geometry EOC assessment consists of selected-response and technology-enhanced items.

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. For more information on scoring, please see the *Georgia Milestones End-of-Course (EOC) Interpretive Guide for Score Reports*.

EXAMPLE ITEMS

Example items, which are representative of the applicable DOK levels across various Analytic 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

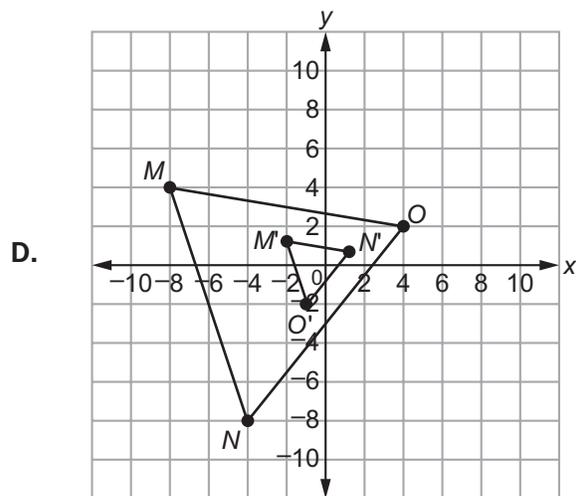
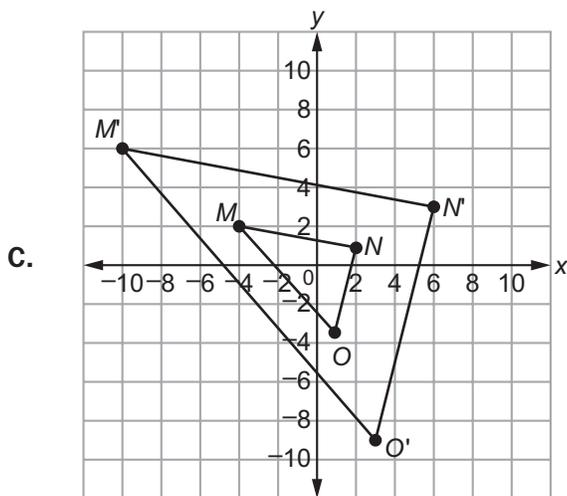
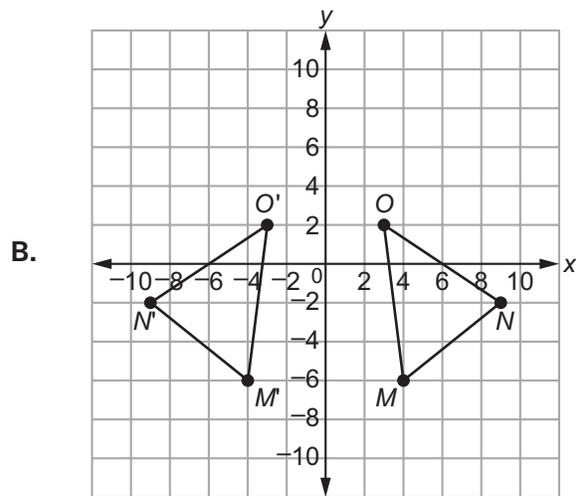
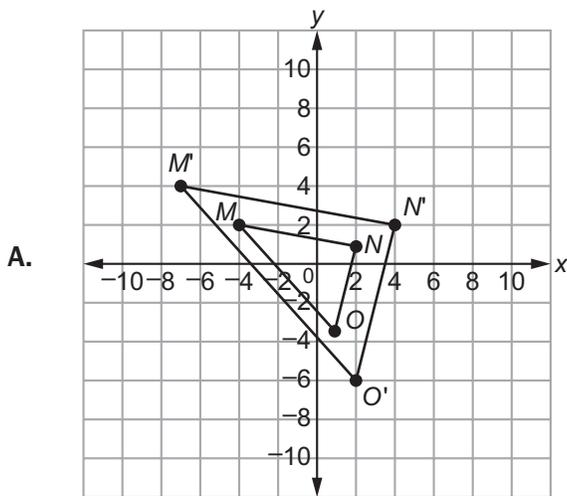
Selected-Response: 1 point

DOK Level: 1

Analytic Geometry Content Domain: Congruence and Similarity

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?



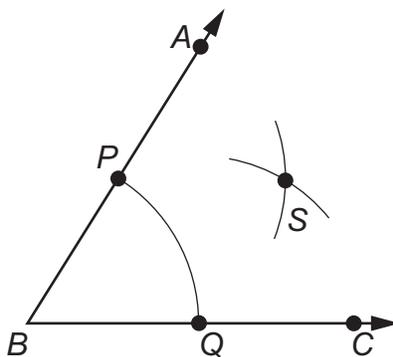
Correct Answer: B

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**Analytic Geometry Content Domain:** Congruence and Similarity

Standard: MGSE9-12.G.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**Analytic Geometry Content Domain:** Circles**Standard:** MGSE9-12.G.GPE.1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

The points $O(-4, 3)$, $A(x, y)$, and $B(x, 3)$ create a right triangle inside Circle O . Point A lies on the circle. OA is 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. $(x + 4)^2 + (y - 3)^2 = 36$

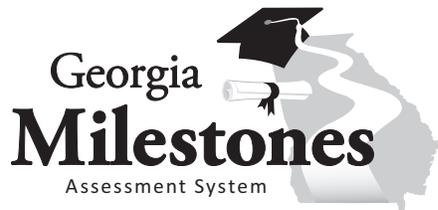
Correct Answer: D

Explanation of Correct Answer: The correct answer is choice (D) $(x + 4)^2 + (y - 3)^2 = 36$. 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.

ADDITIONAL SAMPLE ITEMS

This section has two parts. The first part is a set of 21 sample items for Analytic 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.



Analytic Geometry Formula Sheet

Below are the formulas you may find useful as you take the test. However, you may find that you do not need to use all of the formulas. You may refer to this formula sheet as often as needed.

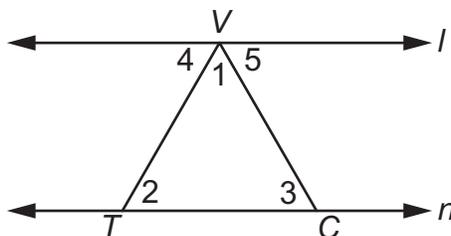
<u>Quadratic Formulas</u>	Area of a Sector of a Circle
Quadratic Equations	$Area\ of\ Sector = \frac{\pi r^2 \theta}{360}$
Standard Form: $y = ax^2 + bx + c$	Volume
Vertex Form: $y = a(x - h)^2 + k$	Cylinder $V = \pi r^2 h$
Quadratic Formula	Pyramid $V = \frac{1}{3} Bh$
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Cone $V = \frac{1}{3} \pi r^2 h$
Average Rate of Change	Sphere $V = \frac{4}{3} \pi r^3$
The change in the y -value divided by the change in the x -value for two distinct points on a graph.	<u>Statistics Formulas</u>
<u>Geometry Formulas</u>	Conditional Probability
Pythagorean Theorem	$P(A B) = \frac{P(A\ and\ B)}{P(B)}$
$a^2 + b^2 = c^2$	Multiplication Rule for Independent Events
Trigonometric Relationships	$P(A\ and\ B) = P(A) \cdot P(B)$
$\sin \theta = \frac{opp}{hyp}$; $\cos \theta = \frac{adj}{hyp}$; $\tan \theta = \frac{opp}{adj}$	Addition Rule
Equation of a Circle	$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$
$(x - h)^2 + (y - k)^2 = r^2$	
Circumference of a Circle	
$C = \pi d$ or $C = 2\pi r$	
$\pi \approx 3.14$	
Arc Length of a Circle	
Arc Length = $\frac{2\pi r \theta}{360}$	
Area of a Circle	
$A = \pi r^2$	

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

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

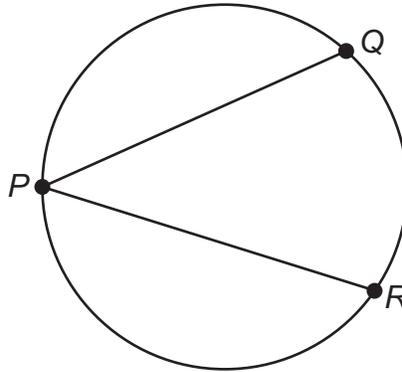
Which equation is equivalent to $x^2 - 16x + 49 = 0$?

- A. $(x - 7)^2 = 0$
- B. $(x - 8)^2 = 0$
- C. $(x - 8)^2 = 2$
- D. $(x - 8)^2 = 15$

Item 3

Selected-Response: 1 point

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



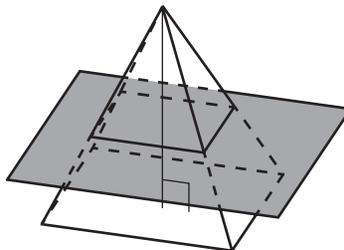
What is $m\angle QPR$?

- A. 18°
- B. 24°
- C. 36°
- D. 72°

Item 4

Selected-Response: 1 point

Look at the square pyramid.



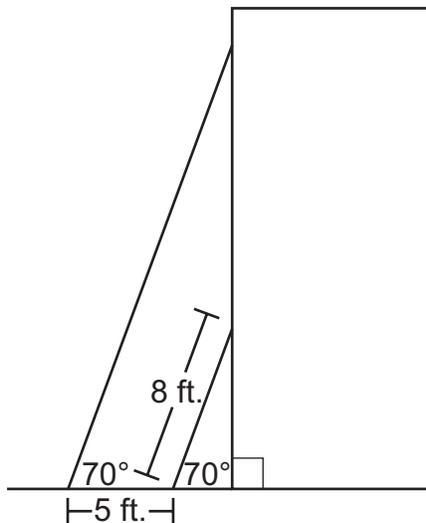
If the plane in the figure is parallel to the base of the pyramid, which BEST describes the shape of the cross-section?

- A. a rectangle
- B. a pentagon
- 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
- B. 13
- C. 23
- D. 26

Item 6

Selected-Response: 1 point

At an aquarium, a tank is being constructed in the shape of a rectangular prism. The tank will be designed to meet the following requirements.

- The tank will have a capacity of 120 cubic feet of water.
- The tank will be 4 feet high.
- The length of the tank will be 3 feet greater than its width.

What is the width, to the nearest hundredth of a foot, of the tank?

- A. 4.18
- B. 9.56
- C. 3.16
- D. 4.63

Item 7

Selected-Response: 1 point

Look at the expression.

$$(2x^2 + 4xy - 8y) - (8xy^2 - 5x^2 - 8y)$$

Which of these is equivalent to this expression?

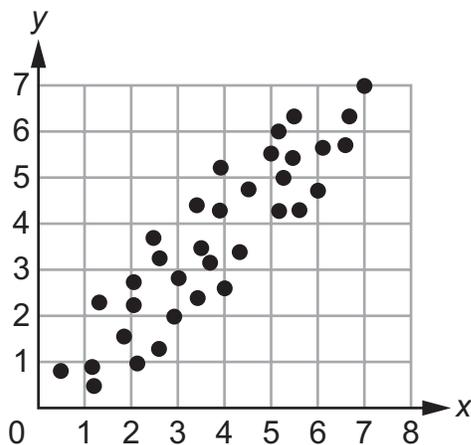
- A. $7x^2 - 4xy^2$
- B. $7x^2 + 4xy - 8xy^2$
- C. $-3x^2 + 4xy^2 - 16y$
- D. $-3x^2 + 4xy - 16y - 8xy^2$

Item 8

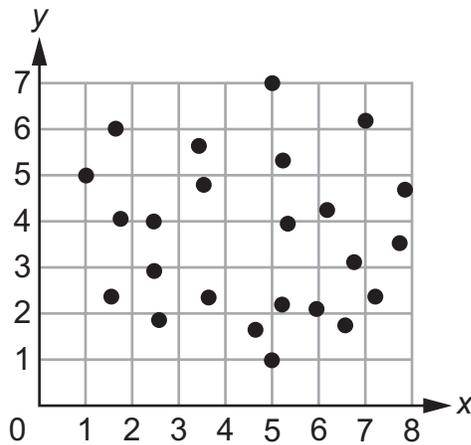
Selected-Response: 1 point

Which set of data could be **BEST** modeled by a quadratic function?

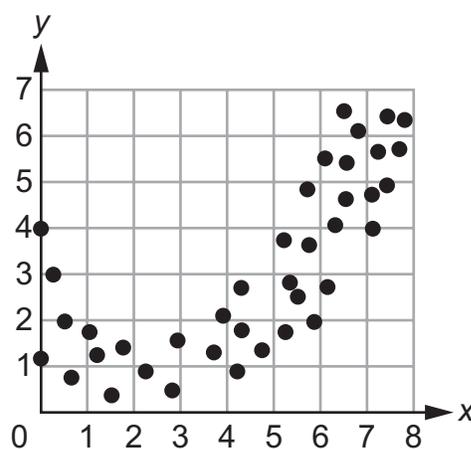
A.



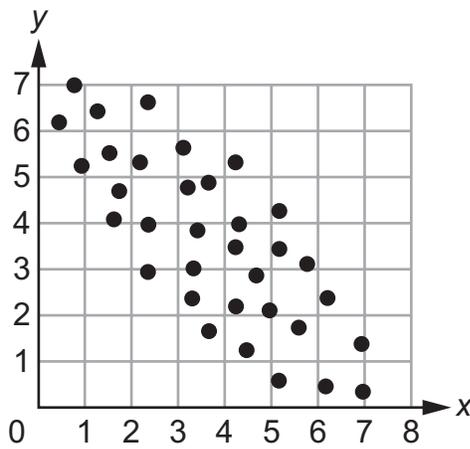
B.



C.

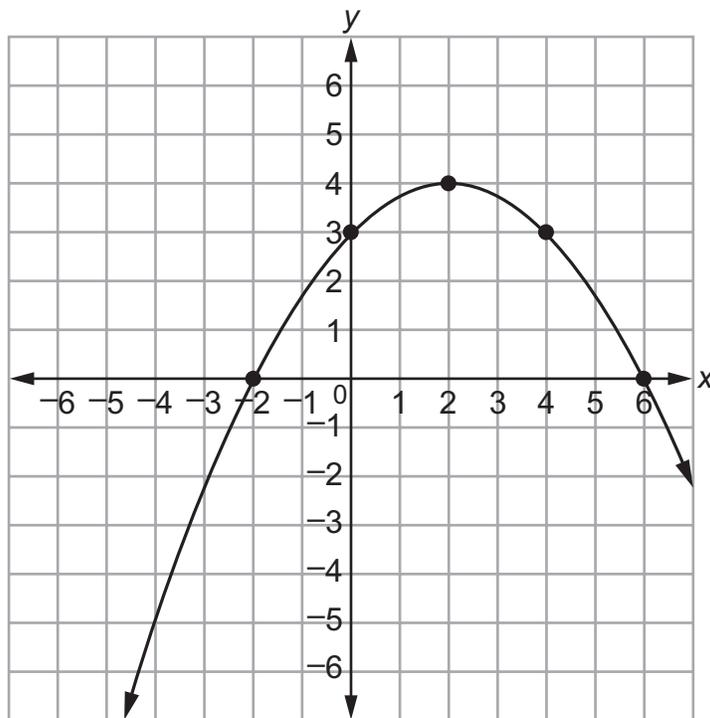


D.



Item 9**Multi-Select Technology-Enhanced:** 2 points**Select THREE equations that are true.**

- A. $(3x^2 + 7x - 4) + (x^2 + x + 3) = 4x^2 + 8x - 1$
- B. $(5x^2 - 6x + 2) - (2x^2 - 4x + 1) = 3x^2 - 2x + 1$
- C. $(3x^2 + 5x + 4) + (x^2 + 2x - 5) = 3x^2 + 7x - 1$
- D. $(6x^2 - 3x - 8) - (3x^2 + 5x - 4) = 3x^2 - 2x - 4$
- E. $(x + 8)(x - 9) = x^2 + x - 72$
- F. $(x - 3)(x - 7) = x^2 - 10x + 21$

Item 10**Multi-Part Technology-Enhanced:** 2 pointsThe coordinate grid shows the graph of the quadratic function $f(x)$.

The equation of $f(x)$ can be written in the form $f(x) = a(x - h)^2 + k$, where a , h , and k are rational numbers.

Part AWhat are the values of h and k ?

- A. $h = -2$ and $k = 3$
- B. $h = -2$ and $k = 6$
- C. $h = 2$ and $k = 3$
- D. $h = 2$ and $k = 4$

Part BWhich statement describes the value of a for the function $f(x)$?

- A. The value of a is a number less than -1 .
- B. The value of a is a number between -1 and 0 .
- C. The value of a is a number between 0 and 1 .
- D. The value of a is a number greater than 1 .

Item 11**Multi-Part Technology-Enhanced:** 2 points**Part A****Which situation could be modeled by a function with a domain of all positive integers?**

- A. the distance a runner has moved during a race as a function of time since the race started
- B. the amount of fish food required in a fish tank as a function of the number of fish in the tank
- C. the amount of power required to operate a computer as a function of the length of time the computer is on
- D. the amount of water required by an animal as a function of the mass of the animal

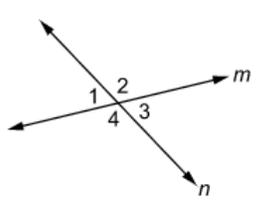
Part B**Select the situation that could be modeled by a function with a domain that includes positive and negative real numbers.**

- A. the height of a plant as a function of time since the seed was planted
- B. the elevation of a hiker as a function of the number of steps taken
- C. the temperature as a function of the time of day
- D. the amount of time required to read a book as a function of the number of words in the book
- E. the amount of precipitation as a function of the outdoor temperature

Item 12

Drag-and-Drop Technology-Enhanced: 2 points

A diagram is shown.



Given: Line m intersects line n .

Prove: $\angle 2 \cong \angle 4$

Move an equation into each empty box in the statement column to complete the proof.

	Statement	Reason
1	Line m intersects line n .	Given
2	$\angle 1$ and $\angle 2$ form a linear pair $\angle 4$ and $\angle 1$ form a linear pair	Definition of a linear pair
3	$m\angle 1 + m\angle 2 = 180^\circ$ $m\angle 4 + m\angle 1 = 180^\circ$	Angles that form a linear pair have measures that sum to 180° .
4		Substitution
5		Subtraction property of equality
6	$\angle 2 \cong \angle 4$	Definition of congruent angles

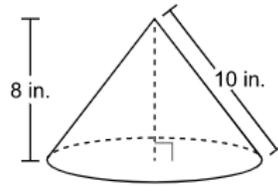
$m\angle 1 = m\angle 3$
 $m\angle 2 = m\angle 4$
 $m\angle 2 + m\angle 3 = 180^\circ$
 $m\angle 2 = m\angle 1 + m\angle 3$
 $m\angle 1 + m\angle 2 = m\angle 4 + m\angle 1$
 $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$

➡ Use a mouse, touchpad, or touchscreen to move an equation into each empty box. Each equation may be used once.

Item 13

Drag-and-Drop Technology-Enhanced: 2 points

A figure is shown.



Move a number into each box to create an equation for the volume of the figure.

?

$V = \square \pi \square^2 \cdot \square$

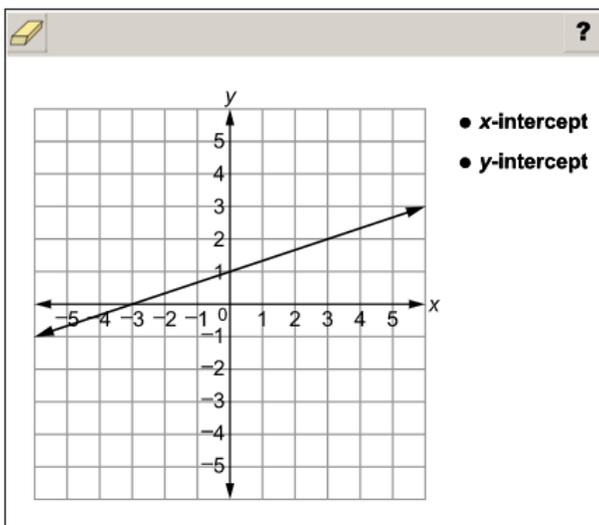
$\frac{1}{3}$
1
 $\frac{4}{3}$
3
4
5
6
8
10

- Use a mouse, touchpad, or touchscreen to move a number into each box. Each number may be used 3 times.

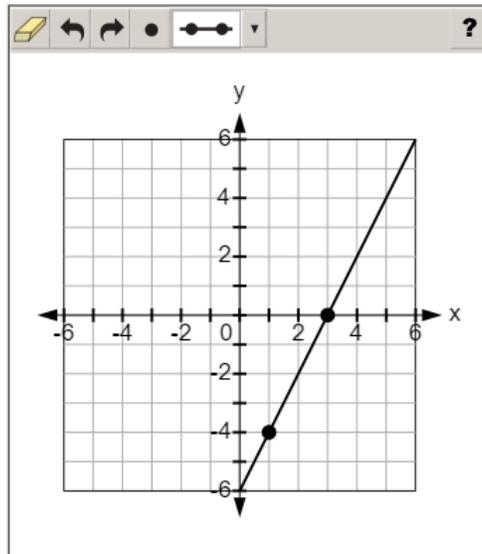
Item 14

Drag-and-Drop Technology-Enhanced: 2 points

Move the labeled points onto the coordinate grid to represent all the x - and y -intercepts for the graphed function. You may select the same labeled point 0, 1, or 2 times.



- ➡ Use a mouse, touchpad, or touchscreen to move the labeled points onto the coordinate grid. Each labeled point may be used twice.

Item 15**Coordinate-Graph Multi-Part Technology-Enhanced: 2 points****Part A****Part A**Linear function $f(x)$ is graphed on the coordinate grid.Graph the linear function $g(x) = f(x) + 4$.

- Use a mouse, touchpad, or touchscreen to graph a line on the coordinate grid. At most 1 line and 2 points can be graphed.

Go on to the next page to finish item 15.

Item 15. *Continued.*

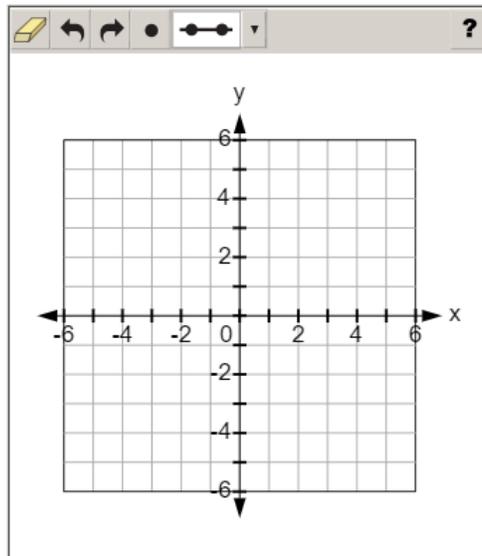
Part B

Part B

The equation of linear function $h(x)$ is shown.

$$h(x) = -\frac{1}{2}x + 4$$

Graph the linear function $j(x) = h(x) - 6$.



- ➡ Use a mouse, touchpad, or touchscreen to graph a line on the coordinate grid. At most 2 lines and 4 points can be graphed.

Item 16

Drag-and-Drop Technology-Enhanced: 2 points

Keela asked 20 people about their favorite hot beverage and whether they were left-handed or right-handed. Some of the data are displayed in the two-way table.

Move a number into each blank cell to complete the two-way table.

	Coffee	Tea	Cocoa	Total
Left-handed	2			3
Right-handed		5	2	
Total	12		2	

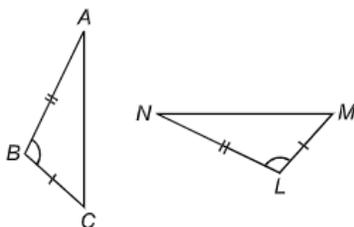
0 1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

- Use a mouse, touchpad, or touchscreen to move a number into each blank cell. Each number may be used 6 times.

Item 17

Drop-Down Technology-Enhanced: 1 point

Two triangles are shown.



Use the drop-down menus to complete the congruence statement.

$\triangle ABC \cong \triangle$ by congruence.

➡ Use a mouse, touchpad, or touchscreen to click the arrow beside each of the two blank boxes. When you click the arrow, a drop-down menu will appear, showing you all the possible options for that blank box. Each drop-down menu with its options is shown below.

$\triangle ABC \cong \triangle$ by congruence.

- | | |
|-----|-----|
| LMN | AA |
| LNM | AAS |
| MLN | ASA |
| MNL | SAS |
| NLM | SSA |
| NML | SSS |

Item 18**Keypad-Input Multi-Part Technology-Enhanced:** 2 points**Part A**

Emily's bus is scheduled to arrive at 6:48 A.M. The probability that Emily arrives at the bus stop after 6:48 A.M. is 0.06. The probability that the bus arrives at the bus stop after 6:48 A.M. is 0.04. The time that Emily arrives at the bus stop and the time that the bus arrives at the bus stop are independent.

Part A What is the probability that the bus arrives at the bus stop after 6:48 A.M. given that Emily arrives at the bus stop after 6:48 A.M.?

						
1	2	3				
4	5	6				
7	8	9				
0	.	(⁻)				

 Use a mouse, touchpad, or touchscreen to enter a response.

Go on to the next page to finish item 18.

Item 18. Continued.

Part B

Emily's bus is scheduled to arrive at 6:48 A.M. The probability that Emily arrives at the bus stop after 6:48 A.M. is 0.06. The probability that the bus arrives at the bus stop after 6:48 A.M. is 0.04. The time that Emily arrives at the bus stop and the time that the bus arrives at the bus stop are independent.

Part B What is the probability that both Emily and the bus will arrive at the bus stop after 6:48 A.M. on a given day?

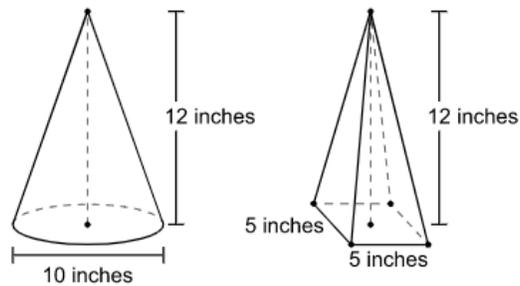
			
<input type="text"/>			
1	2	3	$\frac{\square}{\square}$
4	5	6	
7	8	9	
0	.	(⁻)	

 Use a mouse, touchpad, or touchscreen to enter a response.

Item 19

Keypad-Input Technology-Enhanced: 1 point

A cone and a pyramid are shown.



How many times the volume of the pyramid is the volume of the cone? Use 3.14 for π and round your answer to the nearest tenth.

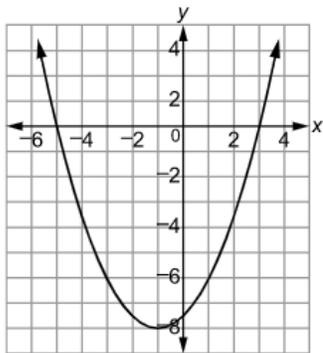
<input type="text"/>			
1	2	3	π
4	5	6	
7	8	9	
0	.	(-)	

Use a mouse, touchpad, or touchscreen to enter a response.

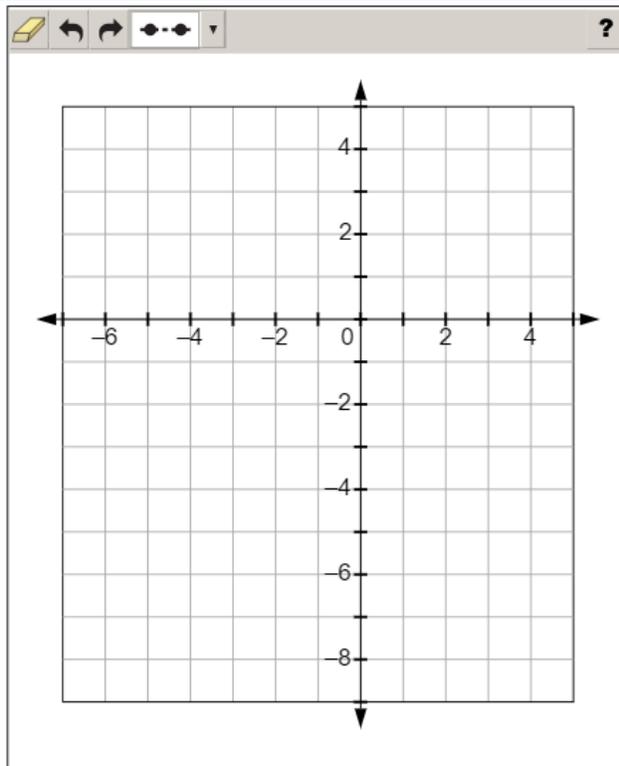
Item 20

Coordinate-Graph Technology-Enhanced: 1 point

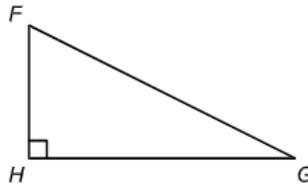
The graph of the function $y = 0.5x^2 + x - 7.5$ is shown.



Draw the axis of symmetry for this function.



- ➡ Use a mouse, touchpad, or touchscreen to graph a line on the coordinate grid. At most 1 line can be graphed.

Item 21**Drag-and-Drop Technology-Enhanced:** 1 pointRight triangle FGH is shown.Move the sides of triangle FGH into the boxes to complete the trigonometric ratio.

A drag-and-drop interface for a trigonometric ratio. At the top left is a yellow eraser icon, and at the top right is a question mark icon. The main area contains the equation $\tan G = \frac{\square}{\square}$. Below the equation are three labels: **FG**, **GH**, and **HF**, each with a small square handle above it for dragging.

-  Use a mouse, touchpad, or touchscreen to move the side labels into the boxes. Each side label may be used 2 times.

ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
1	MGSE9-12.G.CO.10	2	A	The correct answer is choice (A) Alternate interior angles are congruent. Each line is an example of alternate 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	MGSE9-12.A.REI.4a	2	D	The correct answer is choice (D) $(x - 8)^2 = 15$. The given equation is not a perfect square trinomial, and 15 must be added to both sides of the equation to complete the square. Choice (A) is incorrect because the linear term is $16x$ instead of $14x$. Choice (B) is incorrect because it does not account for the adding of 15 to both sides of the equation. Choice (D) is incorrect because it adds 2 to both sides of the equation instead of $2x$.
3	MGSE9-12.G.C.2	1	C	The correct answer is choice (C) 36° . An inscribed angle is one-half the measure of the arc it creates, and half of 72 is 36. 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.4	1	A	The correct answer is choice (A) a rectangle. Choices (B), (C), and (D) are incorrect because they represent the incorrect cross-sections.
5	MGSE9-12.G.SRT.8	3	C	The correct answer is choice (C) 23. 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 ground. 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.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
6	MGSE9-12.G.MG.3	2	A	The correct answer is choice (A) 4.18. The width of 4.18 feet with the given dimensions makes a tank with a volume of 120 cubic feet. Choices (B), (C), and (D) are incorrect because these widths result in a rectangular prism with volumes other than 120 cubic feet.
7	MGSE9-12.A.APR.1	2	B	The correct answer is choice (B) $7x^2 + 4xy - 8xy^2$. Choice (A) is incorrect because unlike terms were combined. Choice (C) is incorrect because -1 is not distributed to any of the terms in the second polynomial. Choice (D) is incorrect because -1 is not distributed to all terms in the second polynomial.
8	MGSE9-12.S.ID.6a	2	C	The correct answer is choice (C). The data in the graph represent a quadratic trend. Choices (A) and (D) are incorrect because the graphs represent a correlation to linear trends. Choice (B) is incorrect because the graph represents data with no clear correlation.
9	MGSE9-12.A.APR.1	2	A/B/F	The correct answers are choices (A), (B), and (F). Choices (A) and (B) are correct because they combine like terms correctly. Choice (F) is correct because the binomials are multiplied correctly. Choices (C) and (D) are incorrect because they do not combine like terms correctly. Choice (E) is incorrect because after the binomials are multiplied, the x terms are not combined correctly.
10	MGSE9-12.F.IF.7a	2	Part A: D Part B: B	Part A: The correct answer is choice (D) $h = 2$ and $k = 4$. The maximum of the function is at point $(2, 4)$, so the value of h is 2 and the value of k is 4. Choices (A), (B), and (C) are incorrect because they all give incorrect values for the maximum of the function, (h, k) . Part B: The correct answer is choice (B) The value of a is a number between -1 and 0 . The function must have a negative number for a , and the shape of the graph indicates that it will be between -1 and 0 . Choice (A) is incorrect because the graph with a value of a less than -1 would be a less wide parabola. Choices (C) and (D) are incorrect because the graph would have a minimum and an increasing end behavior.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
11	MGSE9-12.F.IF.5	2	Part A: B Part B: E	Part A: The correct answer is choice (B) the amount of fish food required in a fish tank as a function of the number of fish in the tank. It is the only choice that models the domain (the number of fish in a tank) as using only positive integers. Part B: The correct answer is choice (E) the amount of precipitation as a function of the outdoor temperature. It is the only choice that models the domain (the outdoor temperature) as using positive and negative real numbers.
12	MGSE9-12.G.CO.9	2	N/A	See scoring rubric and exemplar response on page 45.
13	MGSE9-12.G.GMD.3	2	N/A	See scoring rubric and exemplar response on page 46.
14	MGSE9-12.F.IF.4	2	N/A	See scoring rubric and exemplar response on page 47.
15	MGSE9-12.F.BF.3	2	N/A	See scoring rubric and exemplar response beginning on page 48.
16	MGSE9-12.S.CP.4	2	N/A	See scoring rubric and exemplar response on page 50.
17	MGSE9-12.G.CO.8	2	N/A	See scoring rubric and exemplar response on page 51.
18	MGSE9-12.S.CP.2	2	N/A	See scoring rubric and exemplar response on page 52.
19	MGSE9-12.G.GMD.3	2	N/A	See scoring rubric and exemplar response on page 53.
20	MGSE9-12.F.IF.8a	1	N/A	See scoring rubric and exemplar response on page 54.
21	MGSE9-12.G.SRT.6	1	N/A	See scoring rubric and exemplar response on page 55.

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 12

Scoring Rubric

Points	Description
2	The student correctly places both equations.
1	The student correctly places one equation.
0	The student does not correctly place either equation.

Exemplar Response

The correct response is shown below.

	Statement	Reason
1	Line m intersects line n .	Given
2	$\angle 1$ and $\angle 2$ form a linear pair $\angle 4$ and $\angle 1$ form a linear pair	Definition of a linear pair
3	$m\angle 1 + m\angle 2 = 180^\circ$ $m\angle 4 + m\angle 1 = 180^\circ$	Angles that form a linear pair have measures that sum to 180° .
4	$m\angle 1 + m\angle 2 = m\angle 4 + m\angle 1$	Substitution
5	$m\angle 2 = m\angle 4$	Subtraction property of equality
6	$\angle 2 \cong \angle 4$	Definition of congruent angles

$m\angle 1 = m\angle 3$

$m\angle 2 + m\angle 3 = 180^\circ$

$m\angle 2 = m\angle 1 + m\angle 3$

$m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$

Statement 3 shows two different pairs of angles that add up to 180° ; therefore, one angle pair sum can be substituted in place of the 180° in the equation to create the equation $m\angle 1 + m\angle 2 = m\angle 4 + m\angle 1$, which gives statement 4. Since $m\angle 1$ appears on both sides of the equation in statement 4, the subtraction property of equality can be used to simplify the equation to $m\angle 2 = m\angle 4$, which gives statement 5.

Item 13

Scoring Rubric

Points	Description
2	The student correctly places all three numbers.
1	The student correctly places the radius of 6 OR correctly places the other two numbers.
0	The student does not correctly place the radius of 6 AND does not correctly place the other two numbers.

Exemplar Response

The correct response is shown below.

The screenshot shows a math test interface. At the top left is an eraser icon, and at the top right is a question mark icon. The main area contains the volume formula $V = \frac{1}{3} \pi r^2 h$. The fraction $\frac{1}{3}$, the number 6, and the number 8 are each enclosed in a dashed rectangular box, indicating they are the missing values to be placed. Below the formula is a list of options: $\frac{1}{3}$, 1, $\frac{4}{3}$, 3, 4, 5, 6, 8, and 10.

The formula for volume of a cone is $V = \frac{1}{3}\pi r^2 h$. The information missing from the equation is the $\frac{1}{3}$, the radius, and the height. The height of the cone is 8 inches. Drawing the height of the cone in the center of the base up to the vertex of the cone creates a right triangle, with the slant height of 10 inches serving as the hypotenuse and the height of 8 inches serving as one leg. The Pythagorean theorem can be used to find the missing leg of the triangle, which is the radius of the cone and is 6 inches.

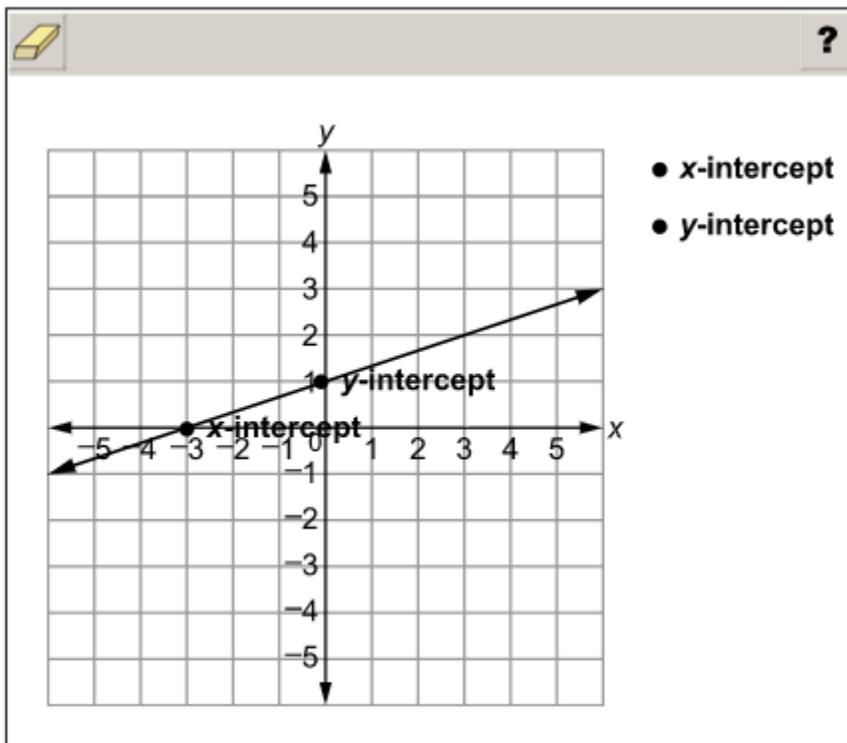
Item 14

Scoring Rubric

Points	Description
2	The student correctly places both the x-intercept and the y-intercept.
1	The student correctly places either the x-intercept or the y-intercept.
0	The student does not correctly place the x-intercept or the y-intercept.

Exemplar Response

The correct response is shown below.



The x-intercept is the point where the line crosses the x-axis. The y-intercept is the point where the line crosses the y-axis.

Item 15

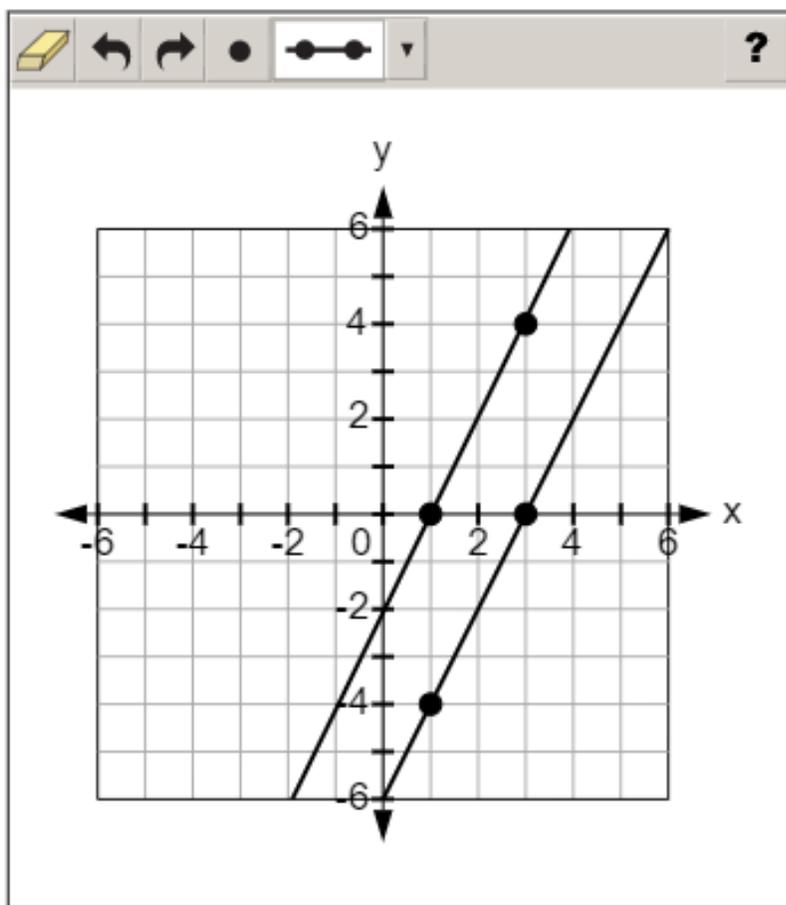
Scoring Rubric

Points	Description
2	The student correctly answers both Part A and Part B.
1	The student correctly answers either Part A OR Part B.
0	The student does not correctly answer either part.

Exemplar Response

Part A

The correct response is shown below.

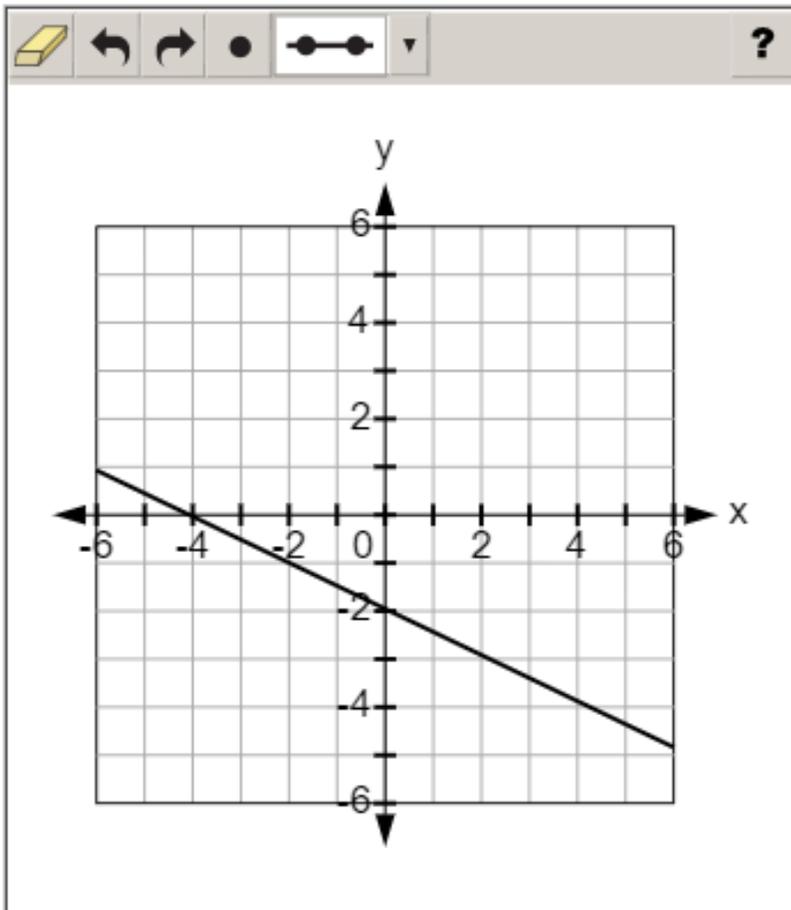


Adding 4 to the function $f(x)$ is equivalent to translating the graph 4 units up. This makes the graph of $g(x)$ parallel to the graph of $f(x)$, and $g(x)$ has a y -intercept of $(0, -2)$.

Go on to the next page to finish item 15.

Item 15**Part B**

The correct response is shown below.



Substituting $-\frac{1}{2}x + 4$ for $h(x)$ in the function $j(x) = h(x) - 6$ yields the function $j(x) = -\frac{1}{2}x - 2$. This is a linear function with a slope of $-\frac{1}{2}$ and a y-intercept of -2 . The graph of this function passes through the points $(0, -2)$ and $(2, -3)$.

Item 16

Scoring Rubric

Points	Description
2	The student correctly places all six missing numbers.
1	The student correctly places three, four, or five missing numbers.
0	The student does not correctly place at least three missing numbers.

Exemplar Response

The correct response is shown below.

?

	Coffee	Tea	Cocoa	Total
Left-handed	2	1	0	3
Right-handed	10	5	2	17
Total	12	6	2	20

0	1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	

Since Keela asked 20 people, the bottom right corner of the table is “20.” From that total value, it can be determined that she asked 17 right-handed people, because 3 people were left-handed. It can also be determined that 6 people said their favorite hot beverage is tea, since $12 + 6 + 2 = 20$. Since 5 people who said tea is their favorite hot beverage are right-handed, only 1 of them is left-handed. With 12 total people saying coffee is their favorite hot beverage, 10 of them have to be right-handed. And with 2 people saying cocoa is their favorite hot beverage, both of whom are right-handed, the number of left-handed people who said cocoa is their favorite hot beverage must be 0.

Item 17**Scoring Rubric**

Points	Description
1	The student selects the correct options in both drop-down menus.
0	The student does not select the correct options in both drop-down menus.

Exemplar Response

The correct response is shown below.

$\triangle ABC \cong \triangle$ by congruence.

“NLM” is correct because of the correspondence between the markings of the two triangles: the double tick mark is on side AB and on side NL , an angle mark is on angle B and on angle L , and the single tick mark is on side BC and on side LM . “SAS” is correct because the markings show corresponding congruent angles between pairs of corresponding congruent sides.

Item 18

Scoring Rubric

Points	Description
2	The student correctly answers both Part A and Part B.
1	The student correctly answers either Part A OR Part B.
0	The student does not correctly answer either part.

Exemplar Response

Part A

The correct response is shown below.

A digital calculator interface showing the input '0.04'. The interface includes a toolbar with icons for erasing, undo, redo, left arrow, right arrow, and a question mark. Below the input field is a numeric keypad with digits 1-9, 0, a decimal point, and a negative sign, along with a fraction template icon.

This is the correct response because the independence of the events means that the probability of the bus arriving after 6:48 given that Emily arrives after 6:48 is the same as the probability of the bus arriving after 6:48.

Part B

The correct response is shown below.

A digital calculator interface showing the input '0.0024'. The interface includes a toolbar with icons for erasing, undo, redo, left arrow, right arrow, and a question mark. Below the input field is a numeric keypad with digits 1-9, 0, a decimal point, and a negative sign, along with a fraction template icon.

This is the correct response because the probability of two independent events occurring together is found by multiplying the probabilities of the two events.

Item 19

Scoring Rubric

Points	Description
1	The student correctly answers the question.
0	The student does not correctly answer the question.

Exemplar Response

The correct response is shown below.

The volume of a square pyramid is found by multiplying one-third times the height of the pyramid times the square of the side length of the base. For this pyramid, the volume is $\frac{1}{3} \times 12 \times 5 \times 5$. The volume of a cone is found by multiplying one-third times the height of the cone times pi times the square of the radius of the base. For this cone, the volume is $\frac{1}{3} \times 12 \times \pi \times 5 \times 5$. Both volumes have factors of $\frac{1}{3}$, 12, 5, and 5, so the volume of the cone is pi times the volume of the pyramid.

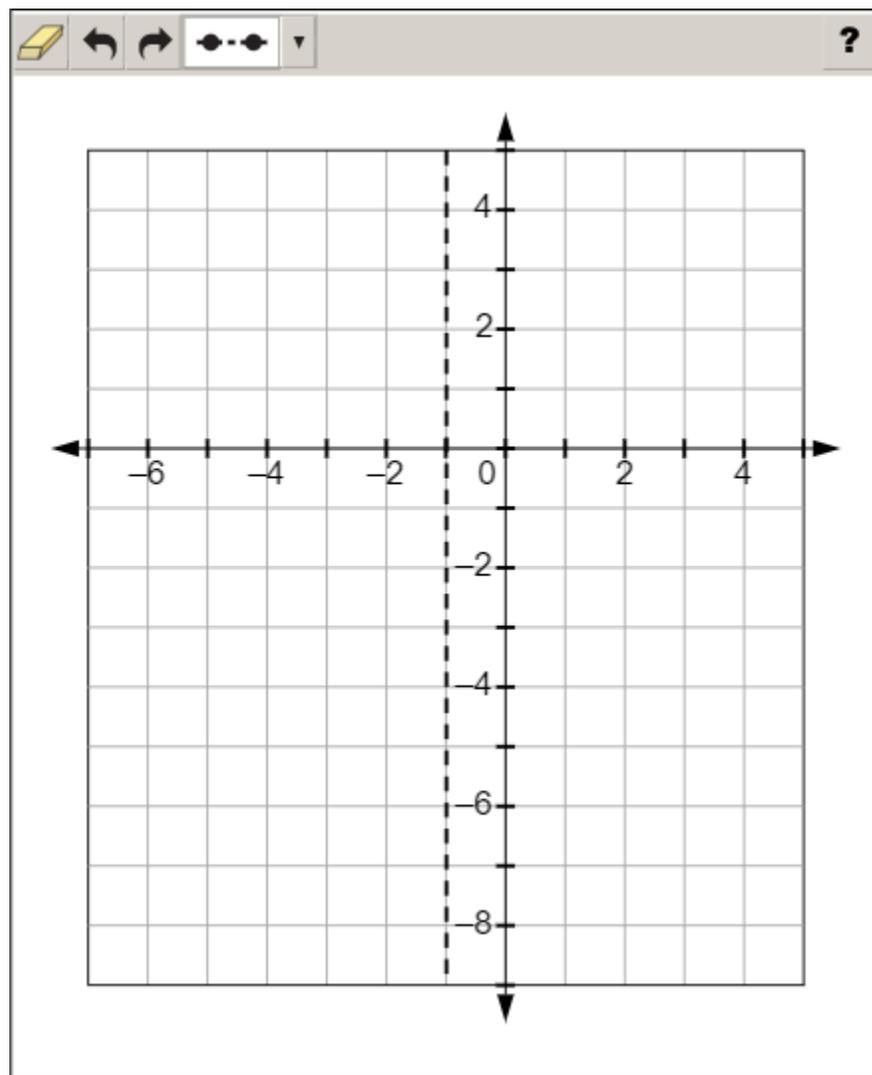
Item 20

Scoring Rubric

Points	Description
1	The student correctly graphs the line of symmetry.
0	The student does not correctly graph the line of symmetry.

Exemplar Response

The correct response is shown below.



This is the correct response because the function is a quadratic function with zeros at -5 and 3 . All quadratic functions have a vertical line of symmetry half way between their zeros.

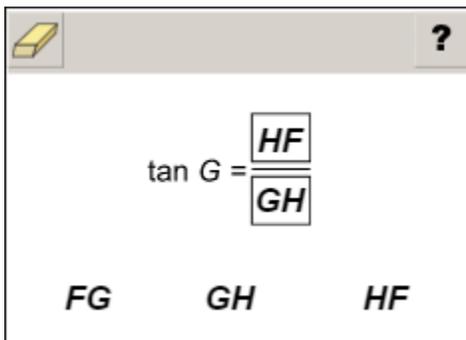
Item 21

Scoring Rubric

Points	Description
1	The student correctly completes the ratio.
0	The student does not correctly complete the ratio.

Exemplar Response

The correct response is shown below.



The screenshot shows a math input field with a yellow eraser icon on the left and a question mark icon on the right. The input field contains the equation $\tan G = \frac{HF}{GH}$. Below the equation, the labels FG , GH , and HF are displayed, corresponding to the sides of a right triangle.

This is the correct response because the tangent of an angle is the ratio of the opposite side length to the adjacent side length. In this triangle, the side opposite angle G is side HF and the side adjacent to angle G is side GH .

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