

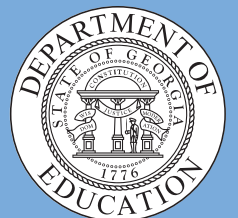
Georgia  
**Milestones**  
Assessment System



**Assessment Guide**  
**Algebra I**



**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; additionally, students in grades 5 and 8 are assessed in Science; and students in grade 8 are assessed in Social Studies. High school students take an end-of-course assessment for each of the five 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 Language Arts assessment; and
- online administration as the primary mode of administration.

The mode of administration for the Georgia Milestones program is online. Paper/pencil test materials, such as Braille forms, will be available for the small number of students who cannot interact with the computer due to their disability as documented in an IEP, IAP/504, or EL-TPC Plan.

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
- includes 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: American Literature and Composition, Algebra I, Coordinate Algebra, Biology, and United States History.

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 Algebra I 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 Algebra I 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](http://www.georgiastandards.org).

## TESTING SCHEDULE

The Georgia Milestones Algebra I 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.

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## TEST STRUCTURE

### DESCRIPTION OF TEST FORMAT AND ORGANIZATION

The Georgia Milestones Algebra I 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. 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 Algebra I EOC assessment.

### Algebra I EOC Assessment Design

Description	Number of Items	Number of Points
1-point Selected-Response and Technology-Enhanced Items <sup>1, 2</sup>	42	42
2-point Technology-Enhanced Items <sup>1</sup>	8	16
Field Test Items <sup>3</sup>	5	0
<b>Total<sup>4</sup></b>	<b>55</b>	<b>58</b>

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

<sup>2</sup> **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.

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

<sup>4</sup> **Total:** Of the total 55 items, 50 contribute to the student's Algebra I 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 Algebra I 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 Algebra I 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 Algebra I 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 Algebra I EOC assessment will measure the Algebra I standards that are described at [www.georgiastandards.org](http://www.georgiastandards.org).

The content of the assessment is organized into three 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 Algebra I are grouped into four domains: Equations, Expressions, Functions, and Algebra Connections to Statistics and Probability. Each domain was created by organizing standards that share similar content characteristics. The content standards describe the level of expertise that Algebra I 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 Algebra I EOC assessment. Educators should always use the content standards when planning instruction.

**Algebra I: Domain Structures and Content Weights**  
**Reporting Categories and Content Standards**

Reporting Category/Domain	Content Standards Assessed	Approximate # of Points	Approximate % of Test
Equations	MGSE9-12.N.Q (1, 2, 3)	17	30%
	MGSE9-12.A.CED (1, 2, 3, 4)		
	MGSE9-12.A.REI (1, 3, 4, 4a, 4b, 5, 6, 10, 11, 12)		
Expressions	MGSE9-12.N.RN (2, 3)	12	20%
	MGSE9-12.A.SSE (1, 1a, 1b, 2, 3, 3a, 3b)		
	MGSE9-12.A.APR (1)		
Functions	MGSE9-12.F.IF (1, 2, 3, 4, 5, 6, 7, 7a, 7e, 8, 8a, 9)	20	35%
	MGSE9-12.F.BF (1, 1a, 2, 3)		
	MGSE9-12.F.LE (1, 1a, 1b, 1c, 2, 3, 5)		
Algebra Connections to Statistics and Probability	MGSE9-12.S.ID (1, 2, 3, 5, 6, 6a, 6c, 7, 8, 9)	9	15%
<b>Total</b>		<b>58</b>	<b>100%</b>


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

## ITEM TYPES

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

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

## SCORES

Selected-response items and technology-enhanced items are machine scored. However, the Algebra I 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 Algebra I 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

**Algebra I Content Domain:** Expressions

**Standard:** MGSE9-12.N.RN.2. Rewrite expressions involving radicals. (i.e., simplify and/or use the operations of addition, subtraction, and multiplication, with radicals within expressions limited to square roots).

**Which number is equivalent to  $5\sqrt{8} \cdot 3\sqrt{4}$ ?**

- A.  $15\sqrt{2}$
- B.  $60\sqrt{2}$
- C.  $30\sqrt{3}$
- D.  $60\sqrt{3}$

**Correct Answer:** B

**Explanation of Correct Answer:** The correct answer is choice (B)  $60\sqrt{2}$ . The terms are combined. Choices (A), (C), and (D) are incorrect because the radicals were not simplified correctly to be equivalent to the given expression.



**Example Item 2****Selected-Response:** 1 point**DOK Level:** 2**Algebra I Content Domain:** Functions

**Standard:** MGSE9-12.F.BF.2. Write arithmetic and geometric sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.

**The first term in an arithmetic sequence is 5. The fourth term in the sequence is  $-4$ . The tenth term is  $-22$ .**

**Which function can be used to find the  $n$ th term of the arithmetic sequence?**

- A.  $f(n) = -n$
- B.  $f(n) = n + 4$
- C.  $f(n) = -3n + 8$
- D.  $f(n) = \frac{1}{2}(n + 5) + 2$

**Correct Answer:** C

**Explanation of Correct Answer:** The correct answer is choice (C)  $f(n) = -3n + 8$ . Since the sequence is changing at a constant rate and it is given that  $f(1) = 5$  and  $f(4) = -4$ , it can be determined that in 3 terms, the value changes by  $-9$  or that each single term changes by  $-3$ . The function will be in the form  $f(x) = -3n + b$ . Substituting  $f(1)$  can determine that  $5 = -3(1) + b$  to reveal that  $b = 8$ . Choice (A) is incorrect because it is true for  $f(4)$  but not  $f(1)$ . Choice (B) is incorrect because it is true for  $f(1)$  but not  $f(4)$ . Choice (D) is incorrect because it is true for  $f(1)$  but not  $f(4)$ .

**Example Item 3****Selected-Response:** 1 point**DOK Level:** 3**Algebra I Content Domain:** Equations

**Standard:** MGSE9-12.A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e., a solution) or not possible (i.e., a non-solution) under the established constraints.

Jose wants to spend no more than \$30 on apples and grapes for the month. Apples cost \$1.50 per pound, and grapes cost \$2 per pound. Jose also wants his monthly caloric intake from apples and grapes to be greater than 2000 calories. He determines that 1 pound of apples has 200 calories and 1 pound of grapes has 300 calories.

Let  $a$  represent the number of pounds of apples and  $g$  represent the number of pounds of grapes. Which system of inequalities can be used to determine the number of pounds of apples and the number of pounds of grapes that Jose can buy for a month?

A. 
$$\begin{cases} 1.5a + 2g \geq 30 \\ 200a + 300g > 2000 \end{cases}$$

B. 
$$\begin{cases} 1.5a + 2g \leq 30 \\ 200a + 300g > 2000 \end{cases}$$

C. 
$$\begin{cases} 2a + 1.5g \leq 30 \\ 300a + 200g > 2000 \end{cases}$$

D. 
$$\begin{cases} 2a + 1.5g \geq 30 \\ 200a + 300g < 2000 \end{cases}$$

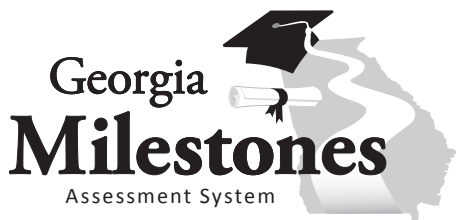
**Correct Answer:** B

**Explanation of Correct Answer:** The correct answer is choice (B)  $1.5a + 2g \leq 30$  and  $200a + 300g > 2000$ . This response correctly assigns the costs of the fruit and recognizes that the sum must be less than or equal to \$30. It also correctly assigns the calories of the fruit and recognizes that this total should be greater than 2,000 calories. Errors made while solving this item represent misunderstandings of how to represent the context in linear inequalities. Choice (A) represents a case where Jose is spending \$30 or more on the fruit. Choice (C) represents confusion over how to assign costs and calories to the proper types of fruit. Choice (D) represents confusion over how to assign the costs to the proper types of fruit, as well as misunderstandings of how to represent the context in linear inequalities.

## ADDITIONAL SAMPLE ITEMS

This section has two parts. The first part is a set of 23 sample items for Algebra I. 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.**



# Algebra I 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.

<p style="text-align: center;"><b><u>Linear Formulas</u></b></p> <p><b>Slope Formula</b></p> $m = \frac{y_2 - y_1}{x_2 - x_1}$ <p><b>Linear Equations</b></p> <p>Slope-intercept Form: <math>y = mx + b</math></p> <p>Point-slope Form: <math>y - y_1 = m(x - x_1)</math></p> <p>Standard Form: <math>Ax + By = C</math></p> <p><b>Arithmetic Sequence Formulas</b></p> <p>Recursive: <math>a_n = a_{n-1} + d</math></p> <p>Explicit: <math>a_n = a_1 + d(n - 1)</math></p> <p style="text-align: center;"><b><u>Exponential Formulas</u></b></p> <p><b>Exponential Equation</b></p> $y = ab^x$ <p><b>Geometric Sequence Formulas</b></p> <p>Recursive: <math>a_n = r(a_{n-1})</math></p> <p>Explicit: <math>a_n = a_1 \cdot r^{n-1}</math></p> <p><b>Compound Interest Formula</b></p> $A = P\left(1 + \frac{r}{n}\right)^{nt}$ <p style="text-align: center;"><b><u>Quadratic Formulas</u></b></p> <p><b>Quadratic Equations</b></p> <p>Standard Form: <math>y = ax^2 + bx + c</math></p> <p>Vertex Form: <math>y = a(x - h)^2 + k</math></p> <p><b>Quadratic Formula</b></p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	<p><b>Average Rate of Change</b></p> <p>The change in the <math>y</math>-value divided by the change in the <math>x</math>-value for two distinct points on a graph.</p> <p style="text-align: center;"><b><u>Statistics Formulas</u></b></p> <p><b>Mean</b></p> $\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$ <p><b>Interquartile Range</b></p> $IQR = Q_3 - Q_1$ <p>The difference between the first quartile and third quartile of a set of data.</p> <p><b>Mean Absolute Deviation</b></p> $\frac{\sum_{i=1}^n  x_i - \bar{x} }{n}$ <p>The sum of the distances between each data value and the mean, divided by the number of data values.</p>
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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**Which set of data points could be modeled by a line of best fit that is a decreasing linear function?**

- A.  $\{(0, 0), (1, 8), (2, 15), (3, 22), (4, 30)\}$
- B.  $\{(0, 5), (1, 6), (2, 10), (3, 16), (4, 28)\}$
- C.  $\{(0, 50), (1, 42), (2, 33), (3, 25), (4, 16)\}$
- D.  $\{(0, 64), (1, 60), (2, 52), (3, 39), (4, 22)\}$

**Item 2****Selected-Response:** 1 point**Use these functions to answer this question.**

$$P(x) = x^2 - x - 6$$

$$Q(x) = x - 3$$

**What is  $P(x) - Q(x)$ ?**

- A.  $x^2 - 3$
- B.  $x^2 - 9$
- C.  $x^2 - 2x - 3$
- D.  $x^2 - 2x - 9$

**Item 3****Selected-Response:** 1 point

The total daily expenses to operate Sheila's pie bakery are the cost of salaries and ingredients. Sheila has four employees, and she pays each employee a daily rate. On average, it costs the same amount of money to make each pie. This expression shows the total daily expenses for Sheila's bakery to make  $x$  pies.

$$4(75) + \$0.50x$$

**What does the term  $4(75)$  represent?**

- A. the amount of money Sheila must pay her employees per day
- B. the number of pies Sheila must sell per day
- C. the total cost of expenses per pie
- D. the amount of money customers pay per pie

**Item 4****Selected-Response:** 1 point**Which function represents the data in the table?**

$x$	3	6	10	15
$y$	2.5	4	6	8.5

- A.  $f(x) = 2x + 1$
- B.  $f(x) = \frac{x}{2} - 1$
- C.  $f(x) = 2x - 1$
- D.  $f(x) = \frac{x}{2} + 1$

**Item 5**

Selected-Response: 1 point

What is the solution to this system of equations?

$$x - 3y = 1$$

$$x - 2y = 6$$

- A.  $(-4, -5)$
- B.  $(-2, -1)$
- C.  $(4, 1)$
- D.  $(16, 5)$

**Item 6**

Selected-Response: 1 point

Information about the costs of three catering companies is shown in this table.

**Catering Company Costs**

<b>Acme Catering Company</b>	<b>Best Foods Company</b>	<b>Creative Catering Company</b>
\$6 per person plus a flat \$100 time and equipment charge	\$8 per person plus a flat \$40 time and equipment charge	\$10 per person charge with no other fees

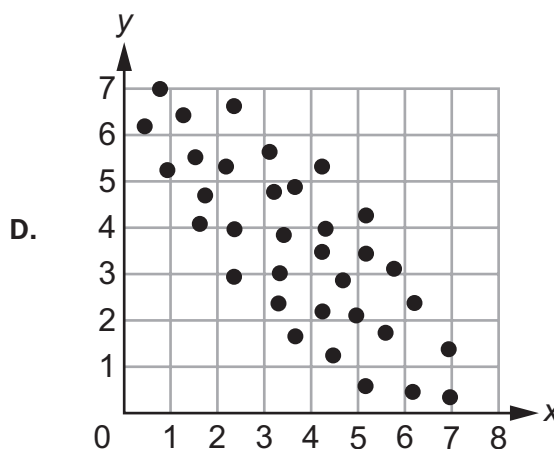
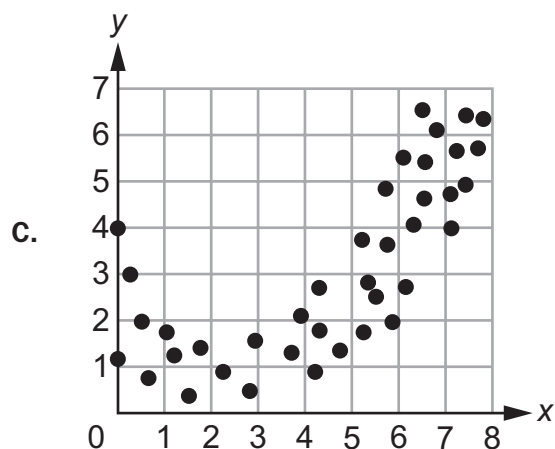
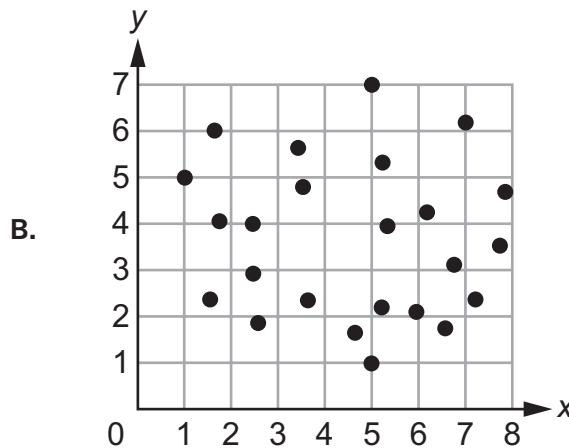
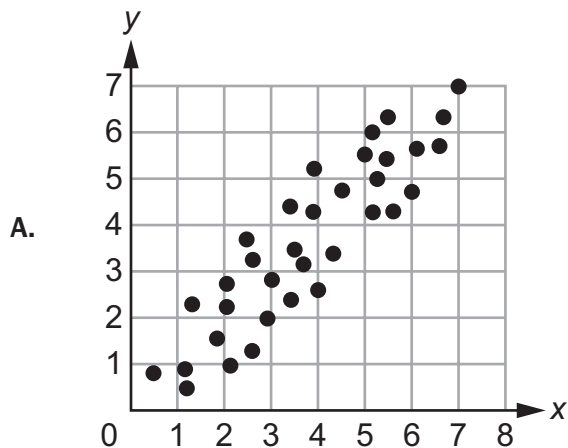
Gavin can spend no more than \$300 on the catering for an event. What is the greatest number of people that Gavin can have at his event without spending more than \$300 on catering?

- A. 30
- B. 32
- C. 33
- D. 37

**Item 7**

**Selected-Response:** 1 point

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



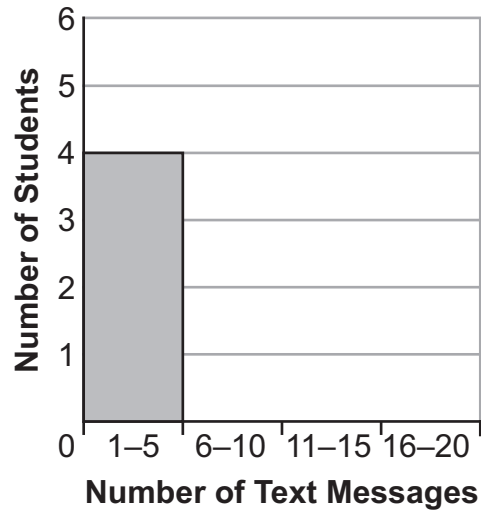


**Item 8****Selected-Response:** 1 point

This list shows the number of text messages each student in a group sent in one day.

16, 2, 8, 5, 3, 20,  
15, 4, 9, 16, 19, 17

The students are creating this histogram to show their data.



What should be the height of the bar for 6–10 text messages?

- A. 1
- B. 2
- C. 4
- D. 5

**Item 9****Multi-Select Technology-Enhanced:** 2 pointsThe set of ordered pairs shown represents a function,  $f$ .

$$\{(-5, 3), (4, 9), (3, -2), (0, 6)\}$$

Select **THREE** ordered pairs that could be added to the set that would allow  $f$  to remain a function.

- A.  $(-3, -2)$
- B.  $(4, 0)$
- C.  $(0, -1)$
- D.  $(1, 6)$
- E.  $(2, 3)$
- F.  $(-5, 9)$

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

A quadratic function is shown.

$$f(x) = x^2 + 8x + 15$$

**Part A**What is the factored form of  $f(x)$  that reveals the zeros of the function?

- A.  $f(x) = (x + 4)(x + 2)$
- B.  $f(x) = (x + 3)(x + 5)$
- C.  $f(x) = (x + 2)(x + 6)$
- D.  $f(x) = (x + 1)(x + 15)$

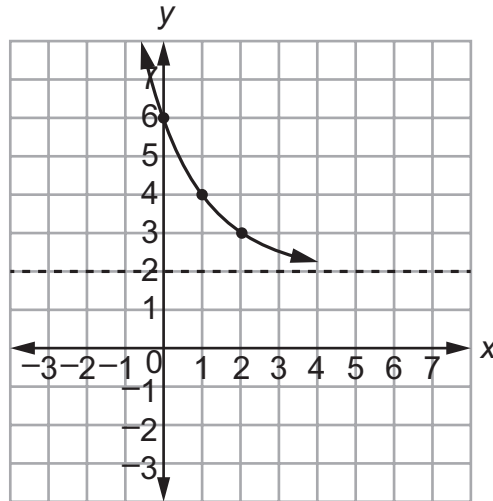
**Part B**What is the equivalent form of  $f(x)$  that reveals the minimum value of the function?

- A.  $f(x) = (x + 4)^2 - 1$
- B.  $f(x) = (x + 3)^2$
- C.  $f(x) = (x + 2)^2 + 3$
- D.  $f(x) = (x + 1)^2 + 8$

**Item 11**

**Multi-Part Technology-Enhanced:** 2 points

The graph of the exponential function  $f(x) = 4(0.5)^x + 2$  is shown.

**Part A**

Which function has the same end behavior as  $f(x)$  for large, positive values of  $x$ ?

- A.  $g(x) = 4(1.1)^x + 3$
- B.  $g(x) = 0.5(1.1)^x + 2$
- C.  $g(x) = 4(0.8)^x + 3$
- D.  $g(x) = 0.5(0.8)^x + 2$

**Part B**

Which function's graph has a y-intercept of 1?

- A.  $h(x) = 5(2)^x$
- B.  $h(x) = 5(0.5)^x + 0.5$
- C.  $h(x) = (0.5)^x + 1$
- D.  $h(x) = 0.5(2)^x + 0.5$

### Item 12

**Drag-and-Drop Technology-Enhanced:** 2 points

The steps to correctly solve an equation are shown.

Move a property into each box of the Reason column to justify each step.

	Equation	Reason
Step 1	$4(x + 7) = 9x - 7$	original equation
Step 2	$4x + 28 = 9x - 7$	
Step 3	$28 = 5x - 7$	
Step 4	$35 = 5x$	
Step 5	$7 = x$	

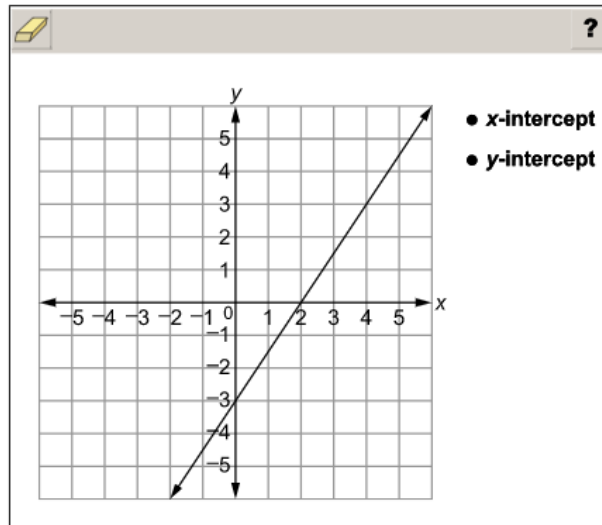
  

<b>Associative Property</b>	<b>Division Property of Equality</b>
<b>Distributive Property</b>	<b>Reflexive Property of Equality</b>
<b>Commutative Property</b>	<b>Subtraction Property of Equality</b>
<b>Addition Property of Equality</b>	<b>Multiplication Property of Equality</b>

- ➡ Use a mouse, touchpad, or touchscreen to move a property into each blank box. Each property may be used 4 times.

**Item 13****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 14

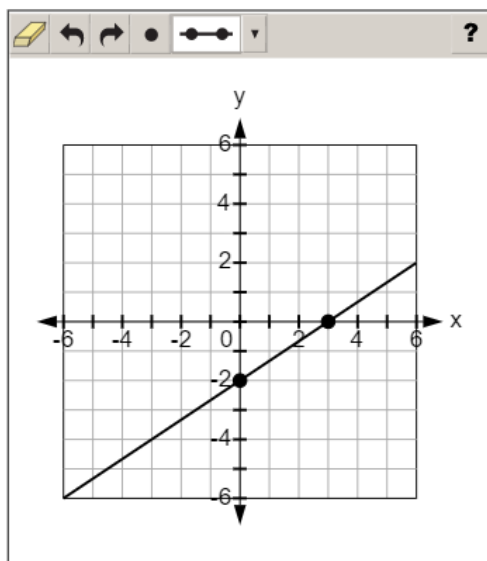
Coordinate-Graph Multi-Part Technology-Enhanced: 2 points

#### Part A

##### Part A

Linear function  $f(x)$  is graphed on the coordinate grid.

Graph the linear function  $g(x) = f(x) + 3$ .



- ➡ 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 14.**

Item 14. *Continued.*

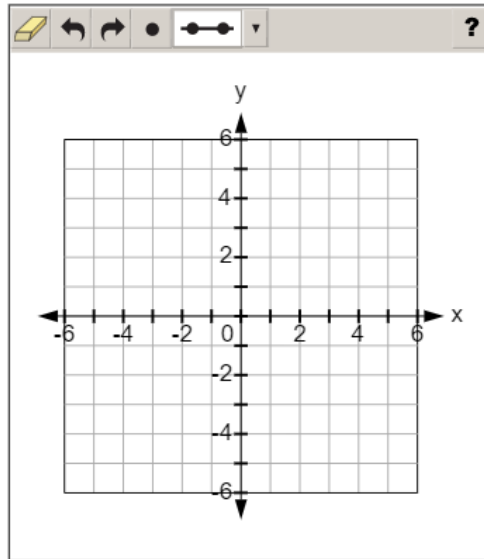
## Part B

## Part B

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

$$h(x) = -2x + 5$$

Graph the linear function  $j(x) = h(x) - 4$ .



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

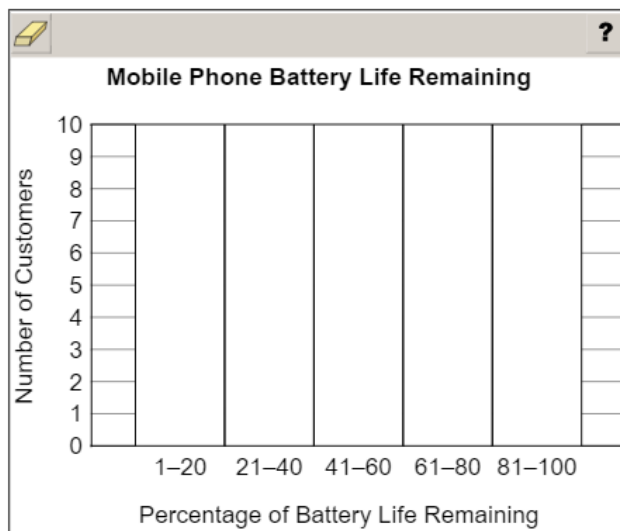
### Item 15

#### Bar-Graph Technology-Enhanced: 2 points

Austin surveys the first 15 customers that walk into a store to find the percentages of battery life remaining on their mobile phones. His data are shown.

56%, 78%, 44%, 61%, 72%, 35%, 67%, 92%, 58%, 34%, 61%, 85%, 54%, 49%, 81%

Create a histogram to represent Austin's data.



➡ Use a mouse, touchpad, or touchscreen to create each bar in the histogram.



## Item 16

Coordinate-Graph Multi-Part Technology-Enhanced: 2 points

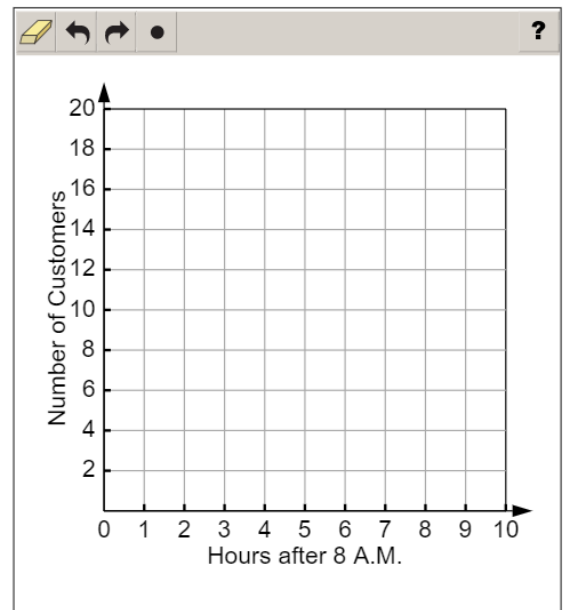
## Part A

The numbers of customers that visited a store each hour for several hours after the store opened at 8 A.M. are shown in the table.

Hours after 8 A.M.	1	3	4	6	9
Number of Customers	2	15	18	13	0

## Part A

Plot each point that corresponds to the data in the table on the coordinate grid.



- ➡ Use a mouse, touchpad, or touchscreen to plot points on the coordinate grid. At most 5 points can be plotted.

**Go on to the next page to finish item 16.**

Item 16. *Continued.*

## Part B

The numbers of customers that visited a store each hour for several hours after the store opened at 8 A.M. are shown in the table.

<b>Hours after 8 A.M.</b>	1	3	4	6	9
<b>Number of Customers</b>	2	15	18	13	0

**Part B**

Which statement BEST describes the data?

- a The data can be modeled by a linear function.
- b The data can be modeled by a constant function.
- c The data can be modeled by a quadratic function.
- d The data can be modeled by an exponential function.



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

## Item 17

Drop-Down Technology-Enhanced: 1 point

Two functions are described below.

- The graph of linear function  $f(x)$  has an  $x$ -intercept of  $(-2, 0)$  and a  $y$ -intercept of  $(0, 3)$ .
- The graph of linear function  $g(x)$  is defined by the equation  $y = \frac{4}{5}x - 2$ .

Use the drop-down menus to complete the statements about the functions.

The  $y$ -intercept of the graph of  $f(x)$  is  the  $y$ -intercept of the graph of  $g(x)$ . The slope of the graph of  $f(x)$  is  the slope of the graph of  $g(x)$ .



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.

The  $y$ -intercept of the graph of  $f(x)$  is  the  $y$ -intercept of the graph of  $g(x)$ . The slope of the graph of  $f(x)$  is  the slope of the gra

greater than  
less than  
the same as

greater than  
less than  
the same as

### Item 18

**Keypad-Input Technology-Enhanced:** 1 point

A table of values is shown.

$x$	$y$
0	3
3	5
6	7
9	9

Create a linear equation that represents the values shown in the table.

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

## Item 19

Drop-Down Multi-Part Technology-Enhanced: 2 points

## Part A

A company sells fruit in cylindrical cans. The cans all have the same height, but there are several different sizes of circular bases. The table shows some information about the different sizes of the cans.

Radius (centimeters)	Area of Base (square centimeters)	Surface Area (square centimeters)	Volume (cubic centimeters)
3	28.26	244.92	282.6
4	50.24	351.68	502.4
5	78.50	471.00	785.0
6	113.04	602.88	1,130.4

Part A The dimensions in the table that have a constant rate relationship are  and .



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.

The dimensions in the table that have a constant rate relationship are  and .

radius  
area of base  
surface area  
volume

radius  
area of base  
surface area  
volume

Go on to the next page to finish item 19.

**Item 19. Continued.****Part B**

A company sells fruit in cylindrical cans. The cans all have the same height, but there are several different sizes of circular bases. The table shows some information about the different sizes of the cans.

Radius (centimeters)	Area of Base (square centimeters)	Surface Area (square centimeters)	Volume (cubic centimeters)
3	28.26	244.92	282.6
4	50.24	351.68	502.4
5	78.50	471.00	785.0
6	113.04	602.88	1,130.4

**Part B** Which statement explains why these dimensions have a constant rate relationship?

- (a) Each entry for both dimensions has a factor of 3.14.
- (b) The second dimension increases by the same percentage over each interval.
- (c) Dividing the second dimension by the first dimension has the same result for each row.
- (d) The second dimension can be found by substituting the first dimension into an equation.



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

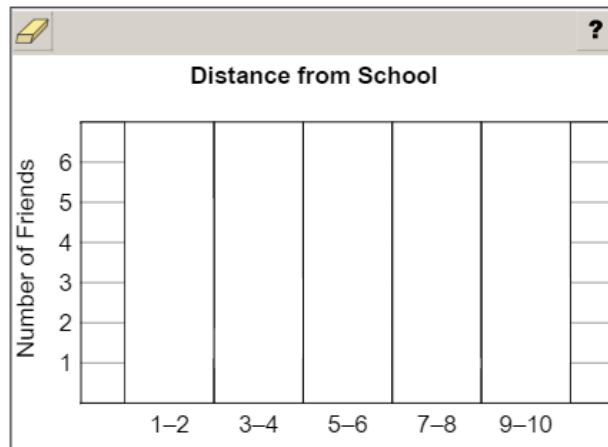
**Item 20****Bar-Graph Technology-Enhanced:** 1 point


Greta collected data on the distance, in miles, that each of her friends lived from their school. The results are shown, but two of the values are missing.

5, 8, 1, 1, 3, 3, ?, ?

When the two missing values are included, the median of the data set will be 3 and the mean of the data set will be 4.

Complete the histogram to represent the data set after determining the two missing values.



 Use a mouse, touchpad, or touchscreen to create each bar in the histogram.

### Item 21

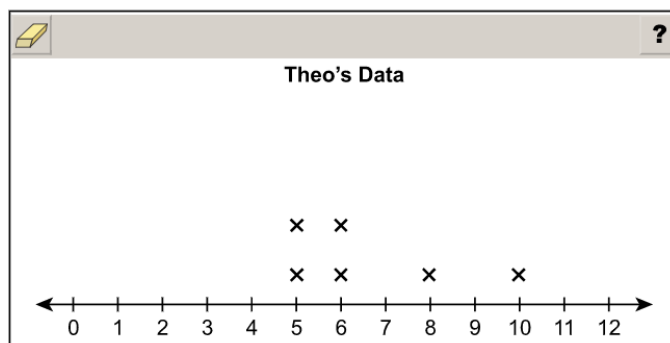
**Line-Plot Technology-Enhanced:** 1 point

Kendra and Theo each collected data on the number of birds they observed at a bird feeder each hour for eight hours. The data Kendra collected is summarized as shown.

- The range of Kendra's data is 6.
- The median of Kendra's data is 7.
- The mean of Kendra's data is 7.

The data Theo collected has the same range and the same median as the data Kendra collected, but the mean of Theo's data is 7.5. The line plot correctly shows six of the eight data points for Theo's data set.

Plot the remaining two data points on the line plot.



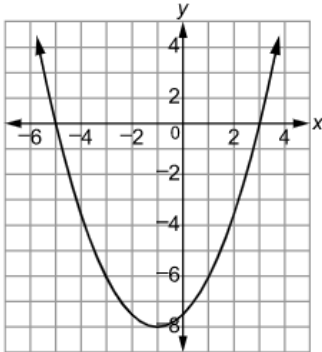
➡ Use a mouse, touchpad, or touchscreen to add Xs to the line plot. At most 2 Xs can be plotted for each number.



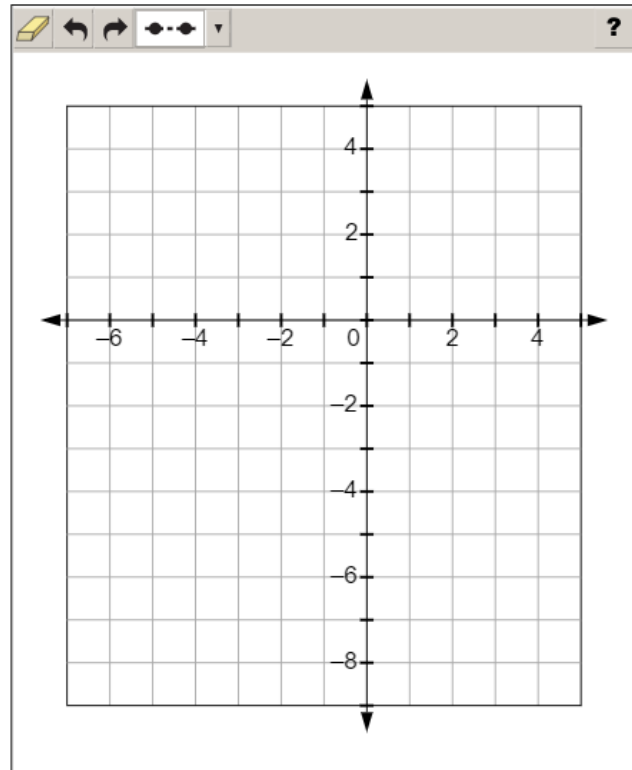
## Item 22


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 23


**Keypad-Input Multi-Part Technology-Enhanced:** 2 points

#### Part A

Michelle will sell her homemade necklaces for \$8 each at a craft fair. It costs her \$150 for the booth rental at the craft fair. She made 200 necklaces to sell.

**Part A** What is the maximum amount, in dollars, of profit Michelle can earn from the sale of her necklaces?

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

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

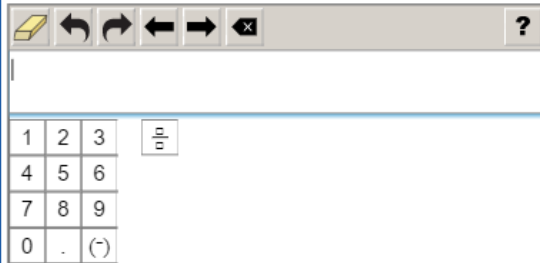
**Go on to the next page to finish item 23.**

**Item 23. Continued.****Part B**


Michelle will sell her homemade necklaces for \$8 each at a craft fair. It costs her \$150 for the booth rental at the craft fair. She made 200 necklaces to sell.

**Part B** Michelle wants to graph the equation for her profit from selling her necklaces. The  $y$ -intercept of this graph will be her profit from selling none of her necklaces.

What is the  $y$ -intercept of the graph of the equation that represents Michelle's profit from selling her necklaces?



1	2	3	$\frac{\square}{\square}$
4	5	6	
7	8	9	
0	.	(-)	

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

## ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
1	MGSE9-12.S.ID.6a	1	C	The correct answer is choice (C) $\{(0, 50), (1, 42), (2, 33), (3, 25), (4, 16)\}$ . This set of data points is the only one from the list that could be modeled by a decreasing linear function, which has a negative value for $a$ in the linear function formula: $f(x) = ax + b$ . Choice (A) is incorrect because the data points correspond to an increasing linear function. Choice (B) is incorrect because the data points correspond to an increasing nonlinear function. Choice (D) is incorrect because the data points correspond to a nonlinear function.
2	MGSE9-12.A.APR.1	2	C	The correct answer is choice (C) $x^2 - 2x - 3$ . This indicates a correct calculation of $P(x) - Q(x) = x^2 - x - 6 - (x - 3) = x^2 - x - 6 - x + 3 = x^2 - 2x - 3$ . Choice (A) is incorrect due to a sign error on the term $x$ . Choice (B) is incorrect due to adding $P(x)$ and $Q(x)$ . Choice (D) is incorrect due to a sign error on the number 3.
3	MGSE9-12.A.SSE.1a	2	A	The correct answer is choice (A) The amount of money Sheila must pay her employees per day. The 4 represents the number of employees and the 75 represents the daily rate she pays each employee. Choice (B) is incorrect because the number of pies Sheila must sell per day is represented by $x$ . Choice (C) is incorrect because the total cost of expenses per pie is represented by the value of the entire expression. Choice (D) is incorrect because the amount of money customers pay per pie is not represented in the expression.
4	MGSE9-12.F.BF.1	2	D	The correct answer is choice (D) $f(x) = \frac{x}{2} + 1$ . When the $x$ -values in the table are substituted for $x$ in this function, the results are equal to the corresponding $y$ -values. Choice (A) is incorrect because it indicates multiplication of 2 and $x$ instead of division of $x$ by 2. Choice (B) is incorrect because it indicates subtraction of 1 instead of addition of 1. Choice (C) is incorrect because it indicates multiplication of 2 and $x$ instead of division of $x$ by 2 and indicates subtraction of 1 instead of addition of 1.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
5	MGSE9-12.A.REI.6	2	D	The correct answer is choice (D) (16, 5). When the values of the coordinate pair are substituted into the system of equations, both sides are equal for both equations. As such, the coordinate pair represents a solution to the system of equations. Choice (A) is incorrect because the values of the coordinate pair, when substituted into the system of equations, result in an incorrect solution for the first equation. Choices (B) and (C) are incorrect because the values of the coordinate pairs, when substituted into the system of equations, result in incorrect solutions for the second equation.
6	MGSE9-12.A.CED.1	3	C	The correct answer is choice (C) 33. At \$6 per person, and with a \$100 flat service charge added, Acme Catering Company can provide services for 33 people at a cost of \$298. Choice (A) is incorrect because it is the number from the Creative Catering Company, but not the largest number possible. Choice (B) is incorrect because it is the number from the Best Foods Company, but not the largest number possible. Choice (D) is incorrect because the student selects the highest number without basing the response on the context provided.
7	MGSE9-12.S.ID.6a	2	C	The correct answer is choice (C). The data in the graph represent a quadratic trend. The graphs in (A) and (D) represent a correlation to linear trends. The graph in (B) represents data with no clear correlation.
8	MGSE9-12.S.ID.1	2	B	The correct answer is choice (B) 2. Only 2 students sent 6–10 text messages. Choice (A) is incorrect because it corresponds to the number of students that sent 11–15 text messages. Choice (C) is incorrect because it corresponds to the number of students that sent 1–5 text messages. Choice (D) is incorrect because it corresponds to the number of students that sent 16–20 text messages.
9	MGSE9-12.F.IF.1	2	A/D/E	The correct answers are choices (A), (D), and (E). Choices (B), (C), and (F) are incorrect because each has the same $x$ -value as an ordered pair already in the function. If any of these values were added, the set would no longer represent a function because there would be one $x$ -value with two different $y$ -values.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
10	MGSE9-12.A.SSE.3	2	Part A: B Part B: A	Part A: The correct answer is choice (B) $f(x) = (x + 3)(x + 5)$ . When multiplied, $(x + 3)(x + 5) = x^2 + 8x + 15$ . Choice (A) is incorrect because $(x + 4)(x + 2) = x^2 + 6x + 8$ . Choice (C) is incorrect because $(x + 2)(x + 6) = x^2 + 8x + 12$ . Choice (D) is incorrect because $(x + 1)(x + 15) = x^2 + 16x + 15$ . Part B: The correct answer is choice (A) $f(x) = (x + 4)^2 - 1$ . When multiplied, $(x + 4)^2 - 1 = x^2 + 8x + 15$ . Choice (B) is incorrect because $(x + 3)^2 = x^2 + 6x + 9$ . Choice (C) is incorrect because $(x + 2)^2 + 3 = x^2 + 4x + 7$ . Choice (D) is incorrect because $(x + 1)^2 + 8 = x^2 + 2x + 9$ .
11	MGSE9-12.F.IF.7e	2	Part A: D Part B: D	Part A: The correct answer is choice (D) $g(x) = 0.5(0.8)^x + 2$ . As $x$ increases to infinity, $y$ approaches 2, and as $x$ decreases to negative infinity, $y$ increases to infinity. Choice (A) is incorrect because as $x$ increases to infinity, $y$ increases to infinity, and as $x$ decreases to negative infinity, $y$ approaches 3. Choice (B) is incorrect because as $x$ increases to infinity, $y$ increases to infinity, and as $x$ decreases to negative infinity, $y$ approaches 2. Choice (C) is incorrect because as $x$ increases to infinity, $y$ approaches 3 instead of 2. Part B: The correct answer is choice (D) $g(x) = 0.5(2)^x + 0.5$ . Choice (A) is incorrect because the $y$ -intercept is 5. Choice (B) is incorrect because the $y$ -intercept is 5.5. Choice (C) is incorrect because the $y$ -intercept is 2.
12	MGSE9-12.A.REI.1	2	N/A	See scoring rubric and exemplar responses on page 48.
13	MGSE9-12.F.IF.4	2	N/A	See scoring rubric and exemplar responses on page 49.
14	MGSE9-12.F.BF.3	2	N/A	See scoring rubric and exemplar responses beginning on page 50.
15	MGSE9-12.S.ID.1	2	N/A	See scoring rubric and exemplar responses on page 52.
16	MGSE9-12.S.ID.6	2	N/A	See scoring rubric and exemplar responses on page 53.
17	MGSE9-12.F.IF.9	2	N/A	See scoring rubric and exemplar responses on page 54.
18	MGSE9-12.A.CED.2	1	N/A	See scoring rubric and exemplar responses on page 55.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
19	MGSE9-12.F.LE.1b	2	N/A	See scoring rubric and exemplar responses on page 56.
20	MGSE9-12.S.ID.1	2	N/A	See scoring rubric and exemplar responses on page 57.
21	MGSE9-12.S.ID.2	3	N/A	See scoring rubric and exemplar responses on page 58.
22	MGSE9-12.F.IF.8a	1	N/A	See scoring rubric and exemplar responses on page 59.
23	MGSE9-12.F.IF.7a	3	N/A	See scoring rubric and exemplar responses on page 60.

## EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

### Item 12

#### Scoring Rubric

Points	Description
2	The student correctly places properties in all four rows.
1	The student correctly places properties in two or three of the rows.
0	The student does not correctly place properties in at least two rows.

#### Exemplar Response

A correct response is shown below.

?

	Equation	Reason
Step 1	$4(x + 7) = 9x - 7$	original equation
Step 2	$4x + 28 = 9x - 7$	<b>Distributive Property</b>
Step 3	$28 = 5x - 7$	<b>Subtraction Property of Equality</b>
Step 4	$35 = 5x$	<b>Addition Property of Equality</b>
Step 5	$7 = x$	<b>Division Property of Equality</b>

**Associative Property**

**Distributive Property**

**Commutative Property**

**Addition Property of Equality**

**Division Property of Equality**

**Reflexive Property of Equality**

**Subtraction Property of Equality**

**Multiplication Property of Equality**

From Step 1 to Step 2, the distributive property is used to simplify the left side of the equation. From Step 2 to Step 3, the subtraction property of equality is used to subtract  $4x$  from both sides of the equation. From Step 3 to Step 4, the addition property of equality is used to add 7 to both sides of the equation. From Step 4 to Step 5, the division property of equality is used to divide both sides of the equation by 5.



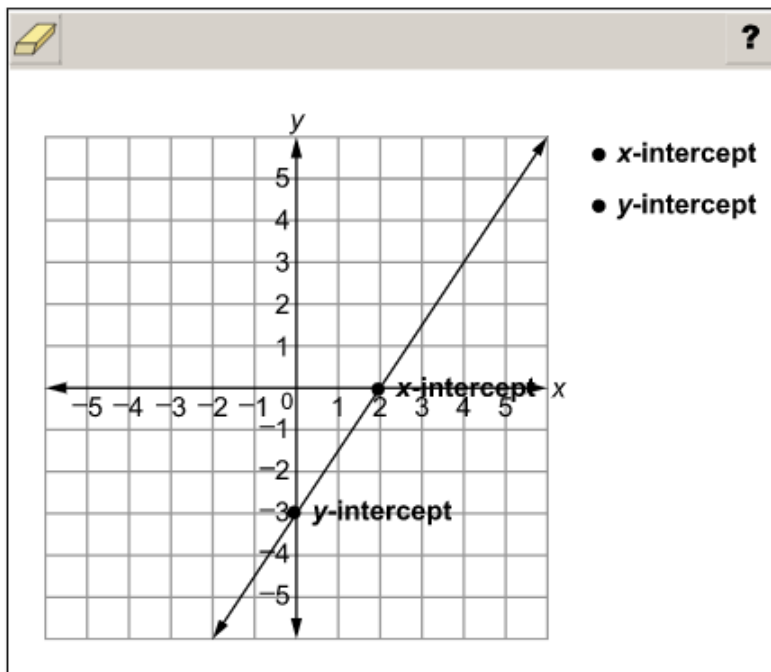
## Item 13

## Scoring Rubric

Points	Description
2	The student correctly places 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 either 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 14**

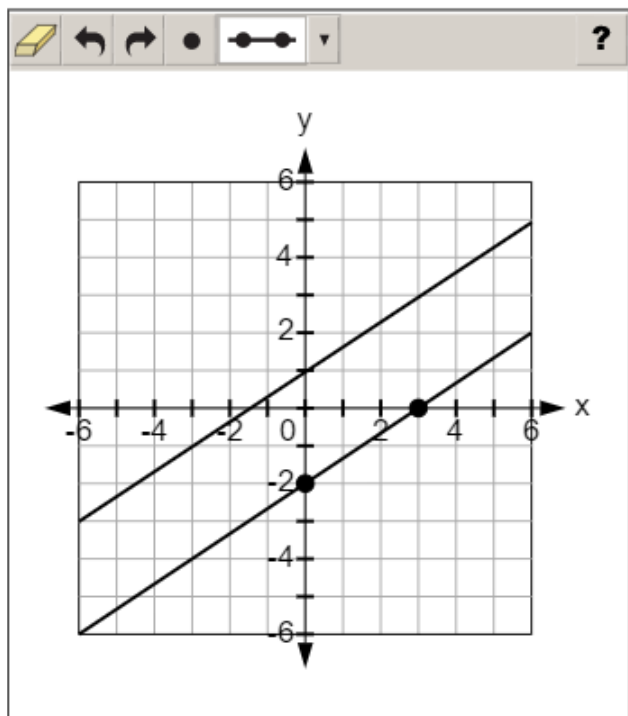
**Scoring Rubric**

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.

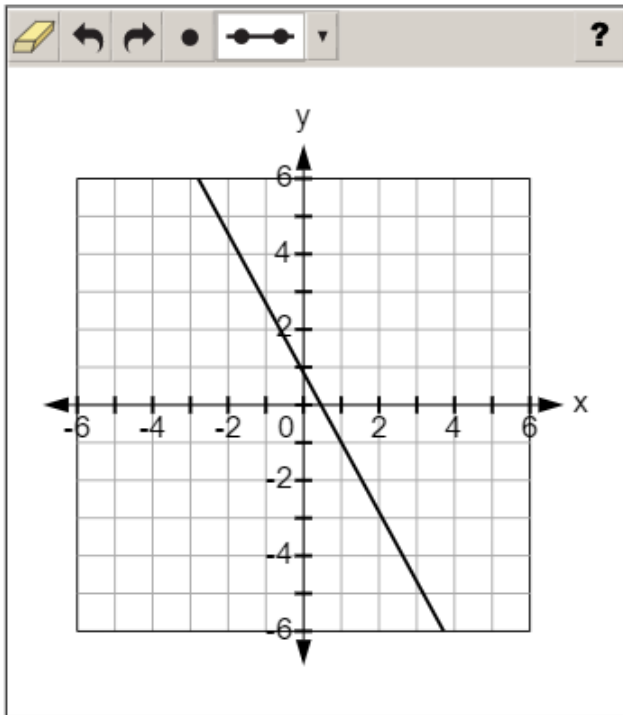


Adding 3 to the function  $f(x)$  is equivalent to translating the graph 3 units up. This makes the graph of  $g(x)$  parallel to the graph of  $f(x)$ , and  $g(x)$  has a y-intercept of  $(0, 1)$ .

**Go on to the next page to finish item 14.**

**Item 14****Part B**

The correct response is shown below.



Substituting  $-2x + 5$  for  $h(x)$  in the function  $j(x) = h(x) - 4$  yields the function  $j(x) = -2x + 1$ . This is a linear function with a slope of  $-2$  and a  $y$ -intercept of  $1$ . The graph of this function passes through the points  $(0, 1)$  and  $(1, -1)$ .

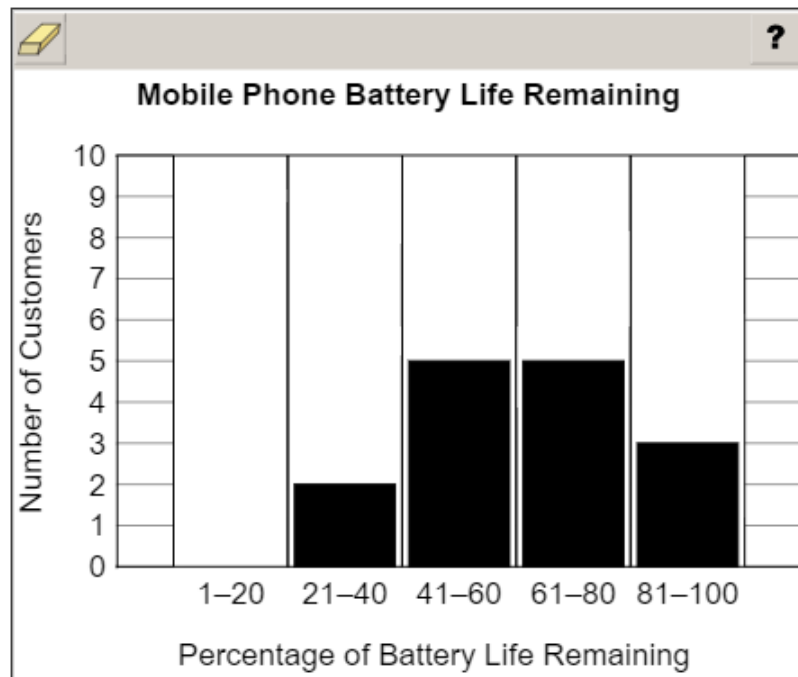
**Item 15**

**Scoring Rubric**

Points	Description
2	The student correctly creates all four bars of the histogram.
1	The student correctly creates two or three bars of the histogram.
0	The student does not correctly create at least two bars of the histogram.

**Exemplar Response**

The correct response is shown below.



A histogram displays the frequency of data items falling within a given range of values. For this data set there are no items in the 1–20 range, 2 items in the 21–40 range, 5 items in the 41–60 range, 5 items in the 61–80 range, and 3 items in the 81–100 range.

## Item 16

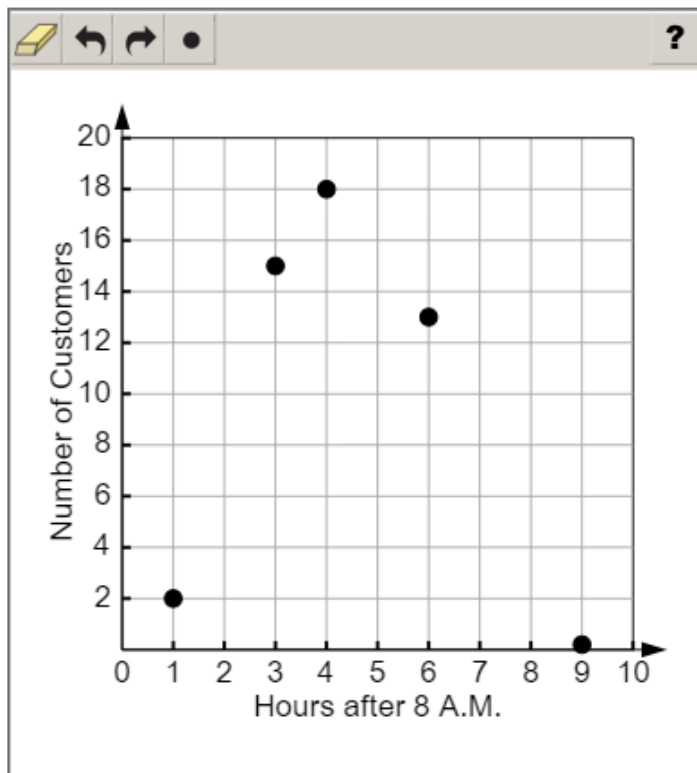
## Scoring Rubric

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.



The values in the table can be represented by ordered pairs, with the  $x$ -coordinates representing the hours after 8 A.M. and the  $y$ -coordinates representing the number of customers. The list of ordered pairs created is  $(1, 2)$ ,  $(3, 15)$ ,  $(4, 18)$ ,  $(6, 13)$ , and  $(9, 0)$ , which are the points plotted on the graph.

## Part B

The correct answer is choice (C) The data can be modeled by a quadratic function. A quadratic function is the best fit to model this situation. Choice (A) is incorrect because a linear function would mean that, as the time goes on, the number of customers would increase or decrease at the same rate without end. Choice (B) is incorrect because a constant function would mean the number of customers is same, no matter what the time is. Choice (D) is incorrect because an exponential function would not model the situation as time goes on.

**Item 17****Scoring Rubric**

Points	Description
1	The student correctly selects both drop-down menu options.
0	The student does not correctly select both drop-down menu options.

**Exemplar Response**

The correct response is shown below.

The  $y$ -intercept of the graph of  $f(x)$  is  the  $y$ -intercept of the graph of  $g(x)$ . The slope of the graph of  $f(x)$  is  the slope of the graph of  $g(x)$ .

“Greater than” is the correct response for the first drop-down menu because the  $y$ -intercept of  $f(x)$  is 3 and the  $y$ -intercept of  $g(x)$  is  $-2$ . “Greater than” is the correct response for the second drop-down menu because the slope of  $f(x)$  is 1.5 and the slope of  $g(x)$  is 0.8.

## Item 18

## 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 screenshot shows a digital math input interface. At the top, there is a toolbar with icons for erasing, undo, redo, left arrow, right arrow, and a close button (X). A question mark icon is also present. Below the toolbar, the equation  $y = \frac{2}{3}x + 3$  is displayed. Below the equation is a keypad with a grid of numbers (1-9, 0, ., (-)), variables (x, y), and mathematical symbols (+, -, •, ÷, <, ≤, =, ≥, >,  $\frac{\square}{\square}$ ,  $\square^\square$ ,  $\square$ ). A question mark icon is also present in the top right corner of the keypad area.

This is the correct response because the  $y$ -values increase by 2 units for every 3 units the  $x$ -values increase by, and  $y$  is 3 when  $x$  is 0. Any equation that is equivalent to the exemplar response will be given credit.

**Item 19****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 two correct responses are shown below.

The dimensions in the table that have a constant rate relationship are  and .

The dimensions in the table that have a constant rate relationship are  and .

This is correct because the volume in each row is 10 times the area of the base in that row. These dimensions are the only ones that exhibit a linear relationship.

**Part B**

The correct answer is choice (C) Dividing the second dimension by the first dimension has the same result for each row. This shows that the volume increases by the same amount over equal intervals of the area of the base, which is necessary for a linear relationship. Choice (A) is incorrect because factors of the dimensions are not related to their linear relationship; other dimensions also have a factor of 3.14. Choice (B) is incorrect because constant rate relationships increase by the same amount over equal intervals rather than the same percentage. Choice (D) is incorrect because substitution can be used in relationships that are not linear.



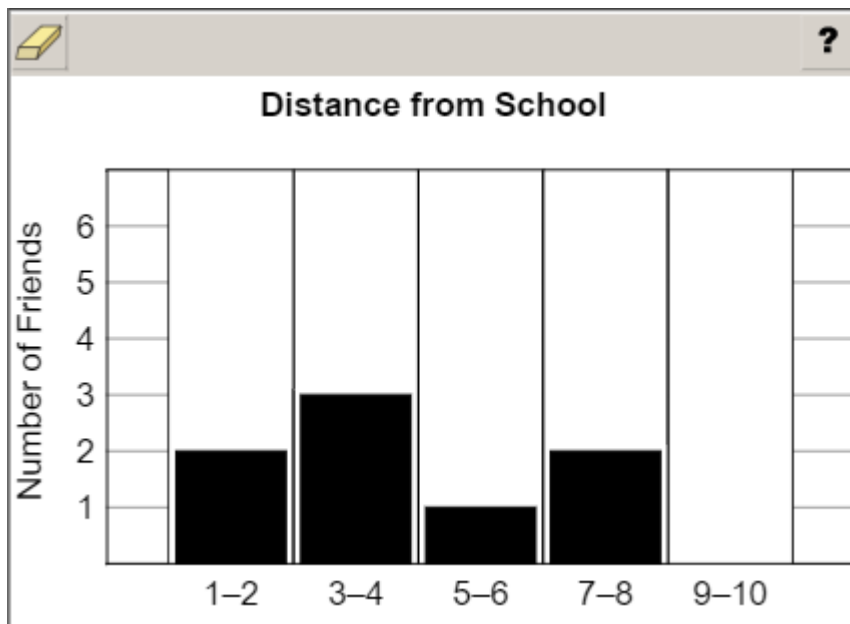
## Item 20

## Scoring Rubric

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

## Exemplar Response

The correct response is shown below.



This is the correct response because the two missing numbers are 3 and 8. Adding those two values to the data set will result in the median being 3 and the mean being 4.

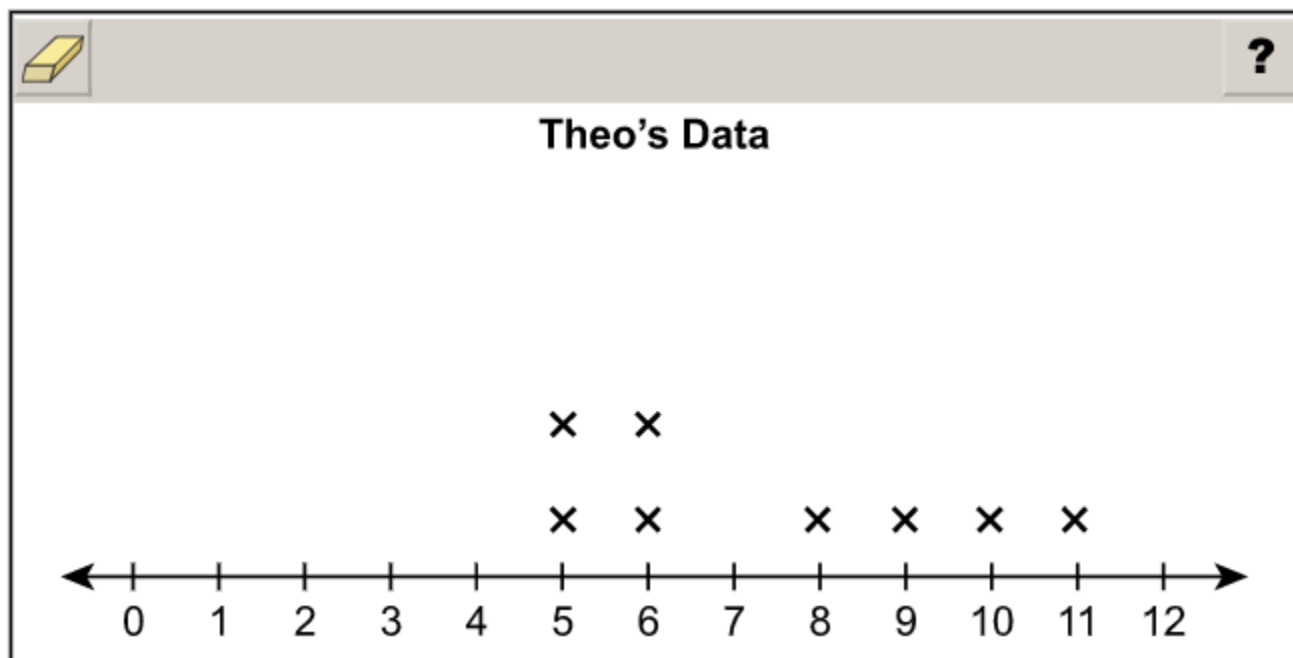
**Item 21**

**Scoring Rubric**

Points	Description
1	The student correctly plots the two Xs.
0	The student does not correctly plot the two Xs.

**Exemplar Response**

The correct response is shown below.



This is the correct response because in order for Theo's data set to have a range of 6, a median of 7, and a mean of 7.5, the two data points must be plotted at 9 and 11.

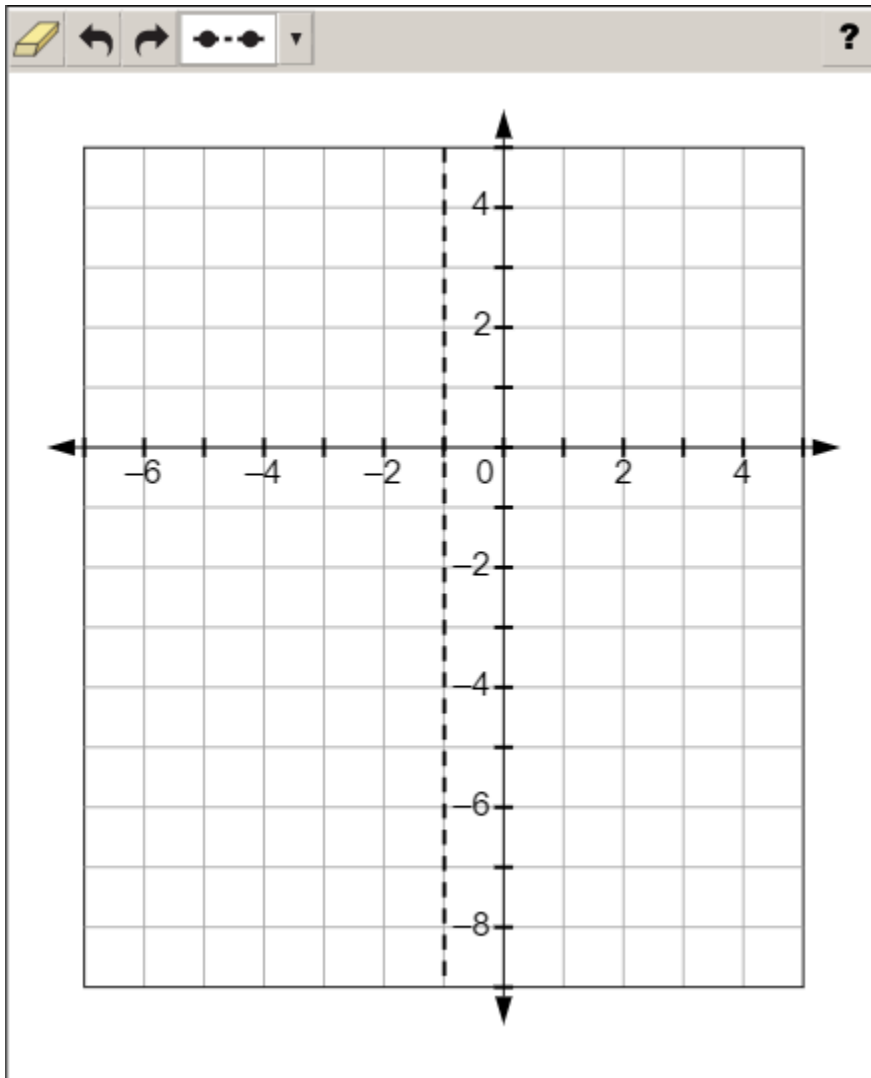
## Item 22

## 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 23**

**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 with a toolbar at the top containing icons for erasing, undo, redo, left arrow, right arrow, and a clear button. A question mark icon is in the top right corner. The display shows the number 1450. Below the display 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  $8 \times 200 = \$1,600$ , which is the maximum she can earn from selling the necklaces. Then, \$150, the cost for renting the booth, is subtracted from \$1,600 to find the profit.

**Part B**

The correct response is shown below.

A digital calculator interface with a toolbar at the top containing icons for erasing, undo, redo, left arrow, right arrow, and a clear button. A question mark icon is in the top right corner. The display shows the number -150. Below the display 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  $y$ -intercept represents the sale of 0 bracelets, which results in \$0 from sales, but she still has to pay \$150 for the booth.

END OF ALGEBRA I  
*EOC ASSESSMENT GUIDE*

Assessment Guide  
Algebra I  
End-of-Course

