MATHEMATICS

DESCRIPTION OF TEST FORMAT AND ORGANIZATION

The Georgia Milestones Mathematics EOG assessment is primarily a criterion-referenced test, designed to provide information about how well a student has mastered the grade-level state-adopted content standards in Mathematics. 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 include a limited sample of nationally norm-referenced items to provide a signal of how Georgia students are achieving relative to their peers nationally. The norm-referenced information provided is supplementary to the criterion-referenced Achievement Level designation and will not be utilized in any manner other than to serve as a barometer of national comparison. Only the criterion-referenced scores and Achievement Level designations will be utilized in the accountability metrics associated with the assessment program (such as student growth measures, educator-effectiveness measures, or the CCRPI).

The Grade 8 Mathematics EOG assessment consists of both operational items (contribute to a student's criterion-referenced and/or norm-referenced score) and field test items (newly written items that are being tried out and do not contribute to the student's score). A subset of the norm-referenced operational items have been verified as aligned to the course content standards by Georgia educators and will also contribute to the criterion-referenced score and Achievement Level designation. The other norm-referenced items will contribute only to the national percentile rank, which is provided as supplemental information.

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

The table on the following page outlines the number and types of items included on the Grade 8 Mathematics EOG assessment.

Grade 8 Mathematics EOG Assessment Design

Description	Number of Items	Points for CR[1] Score	Points for NRT[2] Feedback
CR Selected-Response Items	38	38	0
NRT Selected-Response Items	20[3]	10[4]	20
CR Technology-Enhanced Items	1	2	0
CR Constructed-Response Items	2	4	0
CR Extended Constructed-Response Items	1	4	0
CR Field Test Items	11	0	0
Total Items/Points[5]	**73**	**58**	**20**

[1]CR—Criterion-Referenced: items aligned to state-adopted content standards
[2]NRT—Norm-Referenced Test: items that will yield a national comparison; may or may not be aligned to state-adopted content standards
[3]Of these items, approximately 10 will contribute to both the CR scores and NRT feedback. The other 10 of these items will contribute to NRT feedback only and will not impact the student's Achievement Level designation, scale score, or grade conversion.
[4]Alignment of national NRT items to course content standards was verified by a committee of Georgia educators. Only approved, aligned NRT items will contribute to a student's CR Achievement Level designation, scale score, and grade conversion score.
[5]Of the 73 total items, 52 items contribute to the CR score, for a total of 58 points; 20 total items contribute to NRT feedback, for a total of 20 points.

The test will be given in two sections. Section 1 is divided into two parts. Students may have up to 85 minutes per section to complete Sections 1 and 2. The total estimated testing time for the Grade 8 Mathematics EOG assessment ranges from approximately 120 to 170 minutes. Total testing time describes the amount of time students have to complete the assessment. It does not take into account the time required for the test examiner to complete pre-administration and post-administration activities (such as reading the standardized directions to students). Sections 1 and 2 must be scheduled such that both will be completed in a single day or over the course of two consecutive days (one section each day) and should be completed within the same week following the district's testing protocols for the EOG measures (in keeping with state guidance).

During the Mathematics EOG assessment, a formula sheet will be available for students to use. There is an example of the formula sheet in the Mathematics Additional Sample Items section of this guide. Another feature of the Grade 8 Mathematics EOG assessment is that students may use a scientific calculator in Part B of Section 1 and in all of Section 2.

CONTENT MEASURED

The Grade 8 Mathematics assessment will measure the Grade 8 standards that are described at www.georgiastandards.org.

The content of the assessment is organized into four groupings, or domains, of standards for the purposes of providing feedback on student performance. A content domain is a reporting category that *broadly* describes and defines the content of the course, as measured by the EOG assessment. The standards for Grade 8 Mathematics are grouped into four domains: Numbers, Expressions, and Equations; Algebra and Functions; Geometry; 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 Grade 8 Mathematics 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 EOG 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 Grade 8 Mathematics EOG assessment. Educators should always use the content standards when planning instruction.

GRADE 8 MATHEMATICS: DOMAIN STRUCTURES AND CONTENT WEIGHTS

Reporting Category	Standards Assessed		Approximate Percentage of Test	Approximate Number of Points
Numbers, Expressions, and Equations	MGSE8.NS.1 MGSE8.NS.2 MGSE8.EE.1	MGSE8.EE.2 MGSE8.EE.3 MGSE8.EE.4	20%	12
Algebra and Functions	MGSE8.EE.5 MGSE8.EE.6 MGSE8.EE.7 MGSE8.EE.8 MGSE8.F.1	MGSE8.F.2 MGSE8.F.3 MGSE8.F.4 MGSE8.F.5	40%	23
Geometry	MGSE8.G.1 MGSE8.G.2 MGSE8.G.3 MGSE8.G.4 MGSE8.G.5	MGSE8.G.6 MGSE8.G.7 MGSE8.G.8 MGSE8.G.9	28%	16
Statistics and Probability	MGSE8.SP.1 MGSE8.SP.2	MGSE8.SP.3 MGSE8.SP.4	12%	7

ITEM TYPES

The Mathematics portion of the Grade 8 EOG assessment consists of selected-response, technology-enhanced, constructed-response, and extended constructed-response items.

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

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

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

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

MATHEMATICS DEPTH OF KNOWLEDGE EXAMPLE ITEMS

Example items that represent the applicable DOK levels across various Grade 8 Mathematics 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

Mathematics Grade 8 Content Domain: Numbers, Expressions, and Equations

Standard: MGSE8.NS.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

Which of these is an irrational number?

A. 4.25×10^{-2}

B. $0.\overline{73}$

C. $\sqrt{5}$

D. $\dfrac{456}{5}$

Correct Answer: C

Explanation of Correct Answer: The correct answer is choice (C) $\sqrt{5}$. The square root of a number that is not a perfect square is irrational. Choice (A) is incorrect because it is a terminating decimal in scientific notation, which is rational. Choice (B) is incorrect because it is a repeating decimal, which is rational. Choice (D) is incorrect because it is a fraction whose decimal expansion terminates, which is rational.

Example Item 2

Selected-Response: 1 point

DOK Level: 2

Mathematics Grade 8 Content Domain: Algebra and Functions

Standard: MGSE8.EE.7. Solve linear equations in one variable.
   b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Solve.

$7x - 3(4 + x) = 28$

A. $x = 4$
B. $x = 5$
C. $x = 7$
D. $x = 10$

Correct Answer: D

Explanation of Correct Answer: The correct answer is choice (D) $x = 10$. Applying the distributive property gives the equation $7x - 12 - 3x = 28$. Grouping like terms gives the equation $4x = 40$. Dividing both sides of the equation by 4 gives the solution $x = 10$. Choice (A) is incorrect because it is the result of subtracting 12 from the right side instead of adding. Choice (B) is incorrect because it is the result of failing to distribute the -3 to the x term in the parentheses. Choice (C) is incorrect because it is the result of ignoring the term -12 when grouping like terms, so that the variable terms are set equal to 28 instead of 40.

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Example Item 3

Selected-Response: 1 point

DOK Level: 3

Mathematics Grade 8 Content Domain: Algebra and Functions

Standard: MGSE8.EE.8. Analyze and solve pairs of simultaneous linear equations (systems of linear equations).
> b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example*, $3x + 2y = 5$ *and* $3x + 2y = 6$ *have no solution because* $3x + 2y$ *cannot simultaneously be* 5 *and* 6.

Look at the system of equations.

$$y = x + 4$$
$$2y = 2x + 8$$

Which statement about this system of equations is true and why?

A. It has no solution because the lines are parallel when graphed.
B. It has no solution because the equations are the same line when graphed.
C. It has infinitely many solutions because the lines are parallel when graphed.
D. It has infinitely many solutions because the equations are the same line when graphed.

Correct Answer: D

Explanation of Correct Answer: The correct answer is choice (D) It has infinitely many solutions because the equations are the same line when graphed. The second equation is written as $y = x + 4$ in slope-intercept form, so it has the same slope, 1, and intercept, 4, as the first equation. Therefore, the equations are the same line and there are infinitely many solutions, represented by the points on the line. Choice (A) is incorrect because it assumes the lines are parallel rather than the same line. Choice (B) is incorrect because it misinterpreted coincident lines as having no common solutions. Choice (C) is incorrect because it assumes the lines are parallel and that parallel lines have infinitely many solutions.

MATHEMATICS ADDITIONAL SAMPLE ITEMS

This section has two parts. The first part is a set of 13 sample items for the Mathematics portion of the EOG assessment. 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.
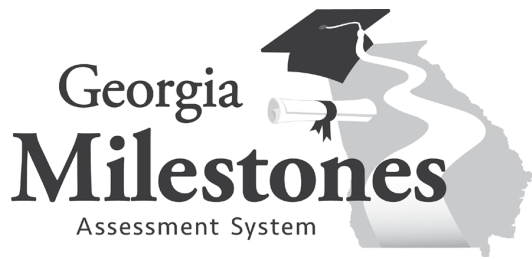
Mathematics
Formula Sheet

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

Look under "EOG Resources."

Item 1

Selected-Response: 1 point

Sofia read that there are approximately 2×10^{11} stars in the Milky Way Galaxy. She also read that there are approximately 3×10^{22} stars in the entire universe.

How many times larger is the number of stars in the universe than the number of stars in the Milky Way Galaxy?

A. 1.5×10^2
B. 1.5×10^{11}
C. 6×10^{11}
D. 6×10^{33}

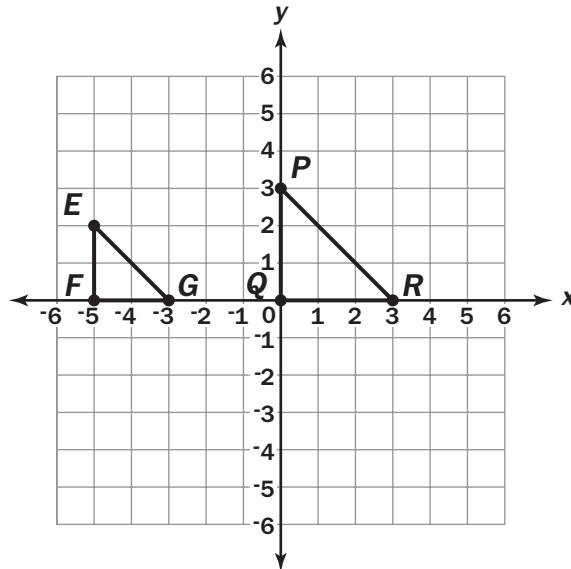### Item 2

Selected-Response: 1 point

The graph of a line passes through the points (0, 6) and (6, 0).

Which of these is the equation of this line?

A. $y = -6x$
B. $y = 6x$
C. $y = x + 6$
D. $y = -x + 6$

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Item 3

Selected-Response: 1 point

Look at triangles *PQR* and *EFG*.

Which of these explains why triangles *PQR* and *EFG* are similar?

A. Triangle *EFG* is a result of dilating triangle *PQR* using a scale factor of $\frac{3}{2}$, with the origin as the center, and reflecting it across the *y*-axis.

B. Triangle *EFG* is a result of dilating triangle *PQR* using a scale factor of $\frac{2}{3}$, with the origin as the center, and reflecting it across the *y*-axis.

C. Triangle *EFG* is a result of dilating triangle *PQR* using a scale factor of $\frac{2}{3}$, with the origin as the center, and translating it 5 units to the left.

D. Triangle *EFG* is a result of dilating triangle *PQR* using a scale factor of $\frac{3}{2}$, with the origin as the center, and translating it 5 units to the left.

Item 4

Selected-Response: 1 point

A weather balloon is released from a height of 10,000 meters. It rises at a constant rate. The graph shows how the balloon's height changes over time.
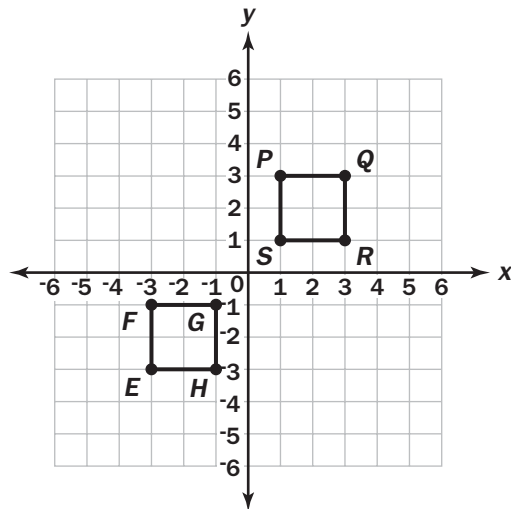

Weather Balloon
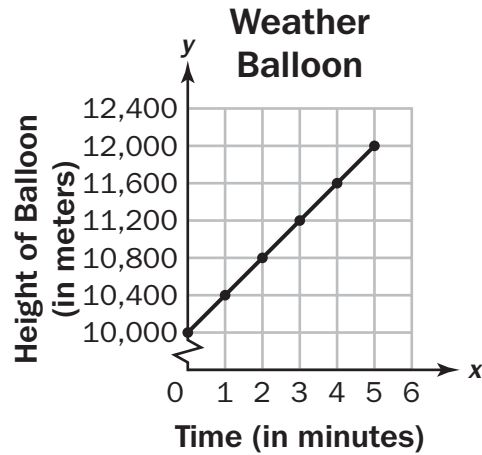
What is the rate of change of the balloon's height, in meters per minute?

A.   400
B.   2,000
C.   2,400
D. 10,400

Item 5

Selected-Response: 1 point

Square *PQRS* is congruent to square *EFGH*.

Which series of transformations to square *PQRS* will result in square *EFGH*?

A. translation down by 3 units followed by reflection across the *y*-axis
B. reflection across the *y*-axis followed by translation down by 5 units
C. reflection across the *x*-axis followed by 45° clockwise rotation about the origin
D. translation to the left by 4 units followed by 90° counterclockwise rotation about the origin

Item 6

Selected-Response: 1 point

Greg wants to compare two different relations. He drew a graph for one relation and created a table of values for the other relation.


x	y
2	2
2	0
2	–2
2	–4
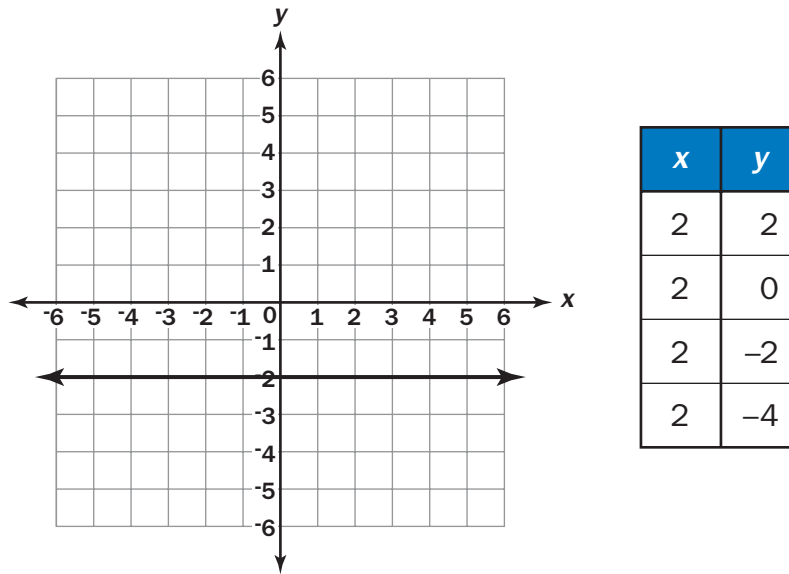
Which statement about this graph and the values in this table is true?

A. Both do not represent functions because they do not pass through the origin.

B. Both represent functions because they are graphically represented as straight lines.

C. The graph represents a function because it is a horizontal line, but the values in the table do not represent a function because there are multiple values for *y* for a single value of *x*.

D. The graph does not represent a function because it is not a vertical line, but the values in the table represent a function because there are multiple values for *y* for a single value of *x*.

Item 7

Selected-Response: 1 point

Harry constructed two scatter plots to represent the relationship between *x* and *y* in two experiments.
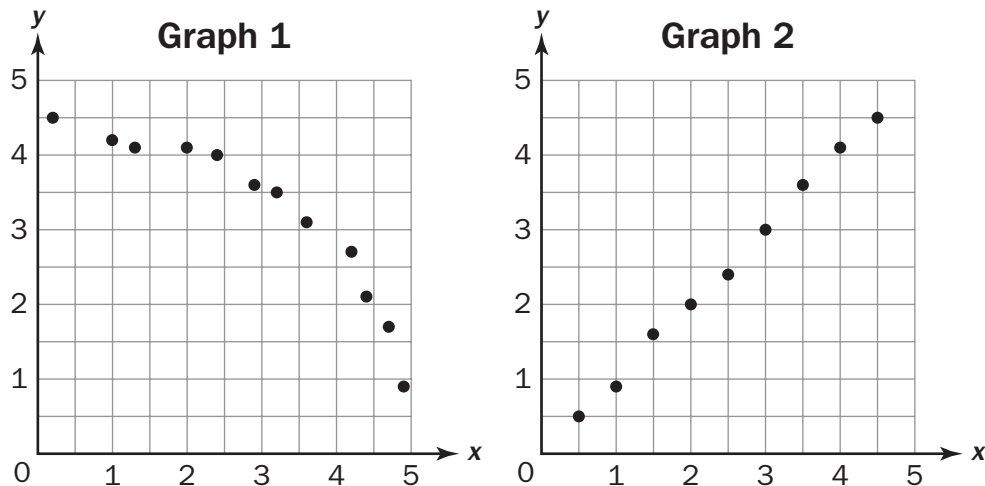
Which statement BEST compares the two graphs?

A. Graph 1 shows a linear positive association, and Graph 2 shows a nonlinear negative association.
B. Graph 1 shows a linear negative association, and Graph 2 shows a nonlinear positive association.
C. Graph 1 shows a nonlinear positive association, and Graph 2 shows a linear negative association.
D. Graph 1 shows a nonlinear negative association, and Graph 2 shows a linear positive association.

Item 8

Selected-Response: 1 point

Figure 1 is rotated counterclockwise by 90° about the origin to obtain Figure 2.
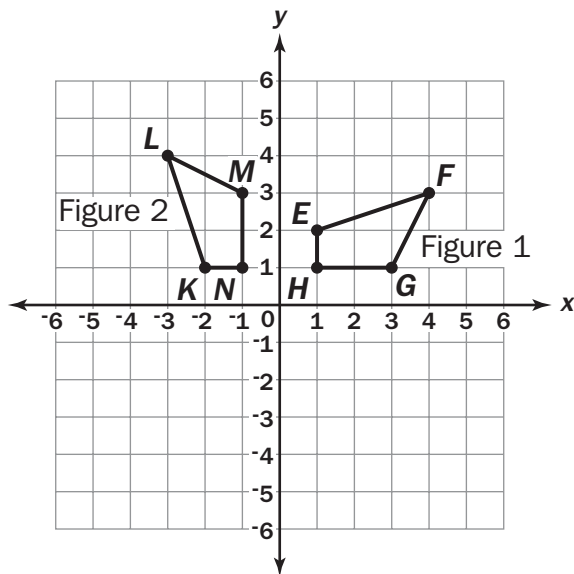
Which statement about the angles in Figure 1 and Figure 2 is true?

A. $m\angle G = m\angle K$

B. $m\angle H = m\angle L$

C. $m\angle G = m\angle M$

D. $m\angle H = m\angle K$

Item 9

Multi-Part Technology-Enhanced: 2 points

The coordinate grid shows right triangle *ABC* and point *D*.
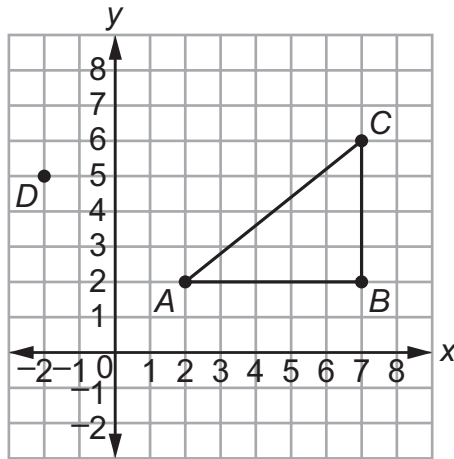
Part A

What is the distance, in units, from point *A* to point *C*?

A. 3
B. $\sqrt{18}$
C. $\sqrt{41}$
D. 9

Part B

What is the distance, in units, from point *A* to point *D*?

A. $\sqrt{7}$
B. $\sqrt{14}$
C. 5
D. 75

Item 10

Multi-Select Technology-Enhanced: 2 points

Select THREE equations whose graphs are straight lines.

A. $y = 7$

B. $y = \dfrac{1}{x}$

C. $y = \dfrac{1}{2}x$

D. $3x + y = 10$

E. $y = x^2 - 2$

F. $x^2 + y^2 = 1$

Item 11

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

The two-way table shows some survey results from when 100 Georgia residents were asked whether they were born in Georgia.

Georgia Residents

	Born in Georgia	Not Born in Georgia	Total
Female			66
Male	16		
Total		47	

The are values missing from the two-way table. You will need to determine the missing values from the two-way table.

Part A

How many of the males surveyed were not born in Georgia?

A. 16
B. 18
C. 29
D. 34

Part B

Select TWO statements that are true about the data.

A. There were more males born in Georgia than there were females born in Georgia.
B. More than half of all residents surveyed were born in Georgia.
C. More males were born in Georgia than were not born in Georgia.
D. More females were not born in Georgia than were born in Georgia.
E. There were more females not born in Georgia than there were males not born in Georgia.

Item 12

Constructed-Response: 2 points

How many solutions does the equation 2(p + 5) = 4 – 10p have? Explain how you found your answer. Write your answer on the lines.

_____

_____

_____

_____

_____

_____

_____

_____

_____

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Item 13

Extended Constructed-Response: 4 points

The United States has an approximate population of 3×10^8 people. Each person in the United States consumes an average of about 14,000 grams of rice per year.

Brazil has an approximate population of 2×10^8 people. Each person in Brazil consumes an average of about 5×10^4 grams of rice per year.

Part A: About how much rice does the United States consume each year?

_____ grams

Part B: About how much rice does Brazil consume each year?

_____ grams

Part C: Which country consumes more rice each year, and how many times more rice does it consume than the other country? Show or explain your work and write your answer on the lines.

MATHEMATICS ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/Element	DOK Level	Correct Answer	Explanation
1	MGSE8.EE.3	2	B	The correct answer is choice (B) 1.5×10^{11}. To divide numbers in scientific notation, divide the coefficients and subtract the exponents of the common base. $\frac{3}{2} = 1.5$ and $22 - 11 = 11$, so the quotient is 1.5×10^{11}. Choice (A) is incorrect because it is the result of dividing the exponents instead of subtracting. Choice (C) is incorrect because it is the result of multiplying 3×2 instead of dividing. Choice (D) is incorrect because it is the product of the two quantities.
2	MGSE8.EE.6	2	D	The correct answer is choice (D) $y = -x + 6$. The slope of the line is the ratio of the change in y-values to the change in x-values: $\frac{(0-6)}{(6-0)} = -1$. The y-intercept is the y-coordinate when $x = 0$, which is 6. So, the equation of the line is $y = -x + 6$. Choices (A) and (B) are incorrect because the y-intercept is confused with the slope. Choice (C) is incorrect because the slope has the incorrect sign.

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Item	Standard/ Element	DOK Level	Correct Answer	Explanation
3	MGSE8.G.4	2	C	The correct answer is choice (C) Triangle *EFG* is a result of dilating triangle *PQR* using a scale factor of $\frac{2}{3}$, with the origin as the center, and translating it 5 units to the left. $\frac{EF}{PQ} = \frac{FG}{QR} = \frac{EG}{PR} = \frac{2}{3}$, so *EFG* is the result of dilating *PQR* using a scale factor of $\frac{2}{3}$. The vertices of *EFG* are 5 units to the left of the corresponding vertices in the dilated triangle, so *EFG* is the result of translating the dilated triangle 5 units to the left. Choice (A) is incorrect because it confuses translation and reflection and uses the reciprocal of the scale factor. Choice (B) is incorrect because it confuses translation and reflection. Choice (D) is incorrect because it uses the reciprocal of the scale factor.
4	MGSE8.F.4	2	A	The correct answer is choice (A) 400. The rate of change of the balloon's height is equal to the slope of the line in the graph. The balloon rises 2,000 meters in 5 minutes, so the rate of change is $\frac{2,000}{5}$ = 400. Choice (B) is incorrect because it is the change in height of the balloon. Choice (C) is incorrect because it calculates the rate of change by dividing 12,000 by 5. Choice (D) is incorrect because it is the height at 1 minute, which is not equal to the rate of change because the graph does not show a proportional relationship.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
5	MGSE8.G.2	2	D	The correct answer is choice (D) translation to the left by 4 units followed by 90° counterclockwise rotation about the origin. Vertex *P* corresponds to vertex *E*, so *PQRS* must be translated 4 units to the left and then rotated 90° counterclockwise about the origin. Choices (A), (B), and (C) are incorrect because the images of *PQRS* will be oriented incorrectly and will not lie on *EFGH*.
6	MGSE8.F.4	2	C	The correct answer is choice (C) The graph represents a function because it is a horizontal line, but the values in the table do not represent a function because there are multiple values for *y* for a single value of *x*. A function has exactly one output for each input. The table does not represent a function because the input $x = 2$ has more than one value for *y* for one *x*-value. Choice (A) is incorrect because it assumes that the graphs of functions always pass through the origin. Choice (B) is incorrect because it assumes that all straight-line graphs represent functions. Choice (D) is incorrect because it confuses the definitions of functions and non-functions.
7	MGSE8.SP.1	2	D	The correct answer is choice (D) Graph 1 shows a nonlinear negative association, and Graph 2 shows a linear positive association. The points on Graph 1 can be best approximated with a curve, and *y*-values decrease as *x*-values increase. The points on Graph 2 can be best approximated with a line, and *y*-values increase as *x*-values increase. Choice (A) is incorrect because it confuses the descriptions of Graph 1 and Graph 2. Choice (B) is incorrect because it misidentifies the patterns in the graph. Choice (C) is incorrect because it confuses positive and negative association.
8	MGSE8.G.1	2	C	The correct answer is choice (C) $m\angle G = m\angle M$. A rotation is a rigid motion, so Figure 1 is congruent to Figure 2 and corresponding angles are congruent. Since angle *G* corresponds with angle *M*, the measures of the angles are equal. Choices (A), (B), and (D) are incorrect because they equate the measures of angles that are not congruent.
9	GSE-1: 8.G.8	2	Part A: C Part B: C	See scoring rubric on page 78.
10	GSE-1: 8.F.3	2	A/C/D	See scoring rubric on page 79.

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Item	Standard/Element	DOK Level	Correct Answer	Explanation
11	GSE-1: 8.SP.4	3	Part A: B Part B: B/E	See scoring rubric on page 80.
12	MGSE8.EE.7a	2	N/A	See scoring rubric and exemplar responses on page 81.
13	MGSE8.EE.4	3	N/A	See scoring rubric and exemplar responses beginning on page 82.

MATHEMATICS EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 9

Scoring Rubric

Points	Description
2	The response achieves the following: • A score of 2 indicates complete understanding of how to apply the Pythagorean Theorem to find the distance between two points in a coordinate system. • The student determines that the correct answer for Part A is Choice (C). AND • The student determines that the correct answer for Part B is Choice (C).
1	The response achieves the following: • A score of 1 indicates a partial understanding of how to apply the Pythagorean Theorem to find the distance between two points in a coordinate system. • The student determines that the correct answer for Part A is Choice (C). OR • The student determines that the correct answer for Part B is Choice (C).
0	The response achieves the following: • A score of 0 indicates limited to no understanding of how to apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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Item 10

Scoring Rubric

Points	Description
2	The response achieves the following: • A score of 2 indicates complete understanding of how to interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. • The student selects Choice (A), Choice (C), and Choice (D).
1	The response achieves the following: • A score of 1 indicates a partial understanding of how to interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. • The student selects Choice (A) and Choice (C), with or without an additional incorrect answer. OR • The student selects Choice (A) and Choice (D), with or without an additional incorrect answer. OR • The student selects Choice (C) and Choice (D), with or without an additional incorrect answer.
0	The response achieves the following: • A score of 0 indicates limited to no understanding of how to interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. • The student selects Choice (A), with or without any additional incorrect answers. OR • The student selects Choice (C), with or without any additional incorrect answers. OR • The student selects Choice (D), with or without any additional incorrect answers. OR • The student does not select any correct answers.

Item 11

Scoring Rubric

Points	Description
2	The response achieves the following: • A score of 2 indicates complete understanding that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. • The student determines that the correct answer for Part A is Choice (B). AND • The student determines that the correct answers for Part B are Choice (B) and Choice (E).
1	The response achieves the following: • A score of 1 indicates a partial understanding that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. • The student determines that the correct answer for Part A is Choice (B). OR • The student determines that the correct answers for Part B are Choice (B) and Choice (E).
0	The response achieves the following: • A score of 0 indicates limited to no understanding that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.

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Item 12

Scoring Rubric

Points	Description
2	The response achieves the following: • The response demonstrates a complete understanding of identifying the number of solutions to a linear equation. • Give 2 points for two key elements that are complete and correct. Response is correct and complete. • Response shows application of a reasonable and relevant strategy. • Mathematical ideas are expressed coherently through clear, complete, logical, and fully developed responses using words, calculations, and/or symbols as appropriate.
1	The response achieves the following: • The response demonstrates a partial understanding of identifying the number of solutions to a linear equation. • Give 1 point for one correct key element; allow for correct parts based on a previous incorrect response(s). • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.
0	The response achieves the following: • The response demonstrates limited to no understanding of identifying the number of solutions to a linear equation. • Response shows no application of a strategy or application of an irrelevant strategy. • Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
2	One solution AND When I solved for p, I got $p = -\dfrac{1}{2}$.
1	One solution OR When I solved for p, I got $p = -\dfrac{1}{2}$. OR A valid conclusion based on an error in the explanation, which implies the equation was solved incorrectly, OR similar.
0	No correct responses

Item 13

Scoring Rubric

Points	Description
4	The response achieves the following: • Response demonstrates a complete understanding of performing operations with numbers expressed in scientific notation. • Give 4 points if student response indicates the correct yearly rice consumption for both countries AND that Brazil consumes 2.4 times more rice each year than the United States. Response is correct and complete. • Response shows application of a reasonable and relevant strategy. • Mathematical ideas are expressed coherently through clear, complete, logical, and fully developed responses using words, calculations, and/or symbols as appropriate.
3	The response achieves the following: • Response demonstrates a near complete understanding of how to perform operations with numbers expressed in scientific notation. • Give 3 points if student response indicates the correct yearly rice consumption for both countries AND that Brazil consumes more rice each year than the United States, but with a calculation error in Part C. Response is nearly completely correct. • Response shows application of a reasonable and relevant strategy. • Mathematical ideas are expressed coherently through clear, complete, logical, and fully developed responses using words, calculations, and/or symbols as appropriate.
2	The response achieves the following: • Response demonstrates some understanding of how to perform operations with numbers expressed in scientific notation. • Give 2 points if student response indicates the correct yearly rice consumption for both countries OR indicates the correct yearly consumption for one of the countries and a correct process for finding how many times more rice one country consumes than the other country based on the incorrect consumption determined in Part A or Part B. Response is only partially correct. • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.
1	The response achieves the following: • Response demonstrates minimal understanding of how to perform operations with numbers expressed in scientific notation. • Give 1 point if student response indicates the correct yearly rice consumption for the United States OR the correct yearly rice consumption for Brazil. Response is only partially correct. • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

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Points	Description
0	The response achieves the following: • Response demonstrates no understanding of how to perform operations with numbers expressed in scientific notation. • The student is unable to calculate the total rice consumption for either country or to determine how many times more rice Brazil consumes than the United States. • Response shows no application of a strategy or application of an irrelevant strategy. • Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
4	Part A: 4.2×10^{12} grams AND Part B: 1×10^{13} grams AND Part C: $$\frac{1 \times 10^{13}}{4.2 \times 10^{12}} \approx 0.24 \times 10^1 = 2.4$$ Brazil consumes about 2.4 times as much rice as the United States.
3	Part A: 4.2×10^{12} grams AND Part B: 1×10^{13} grams AND Part C: $$\frac{1 \times 10^{13}}{4.2 \times 10^{12}} \approx 0.24$$ Brazil consumes 0.24 times as much rice as the United States.

Points Awarded	Sample Response
2	Part A: 4.2 × 10^{13} grams AND Part B: 1 × 10^{13} grams AND Part C: $\dfrac{4.2 \times 10^{13}}{1 \times 10^{13}} = 4.2$ Brazil consumes 4 times as much rice as the United States.
1	Part A: 4.2 × 10^{12} grams OR Part B: 1 × 10^{13} grams
0	Response is irrelevant, inappropriate, or not provided.