Georgia

Milestones

Assessment System

Geometry

Mathematics

Item and Scoring Sampler

2016

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INTRODUCTION

The Georgia Milestones Geometry assessment is a criterion-referenced test designed to provide information about how well a student has mastered the grade-level state-adopted content standards in mathematics. This assessment consists of a variety of item types including selected-response and constructed-response items.

TYPES OF ITEMS INCLUDED IN THE SAMPLER AND USES OF THE SAMPLER

The purpose of this sampler is to provide samples of the type of constructed-response items that appear on the operational Georgia Milestones Geometry assessment. The items in this sampler may be used for classroom instruction purposes. The samples may be copied, and classroom teachers may find it beneficial to have students respond to one or more of the samples. Teachers can then use the information in the sampler as a guide to score responses written by their own students.

MATHEMATICS CONSTRUCTED-RESPONSE ITEM TYPES

A mathematics **constructed-response** item asks a question and solicits the student to provide a response constructed on his or her own, as opposed to selecting from options provided. The constructed-response items on the EOC Mathematics assessment are worth up to 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 does a two-point constructed-response item. The extended constructed-response items on the EOC assessment are worth up to four points. Partial credit may be awarded if part of the response is correct.

ITEM ALIGNMENT

Each constructed-response item included in this sampler has been through a rigorous review process with Georgia educators to ensure alignment with the content standards. The content standard for each sample item is provided in this sampler in the item information tables.

DEPTH OF KNOWLEDGE

In addition to being aligned to the standards, the sample items included in this sampler were developed with a particular emphasis on cognitive complexity, or Depth of Knowledge (DOK). The DOK level is provided for each item in this sampler in the Item Information Table. DOK measures the level of cognitive demand required to complete an assessment item. The following descriptions show the expectations of the 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 evidence (through a task, a product, or an extended response) that the cognitive demands have been met.

ITEM AND SCORING SAMPLER FORMAT

Sample constructed-response questions are provided in this sampler, along with any related stimulus information such as a passage or graphic. Following the test question is the scoring guide for the constructed-response question. The scoring guide includes the Item Information Table, the item-specific scoring guideline, and annotated sample student responses at each score point.

For mathematics items, each item-specific scoring guideline includes an exemplar as one possible correct response. Readers are trained to give credit to alternate valid responses.

The Georgia Milestones assessment may be administered in paper-and-pencil format or online. As a result, this sampler includes samples of students' responses in both formats. This symbol  is used to note the format of a sample online item. It also indicates a sample online response.

Example Constructed-Response Item Information Table

Standard:	**Item Depth of Knowledge:**

Geometry

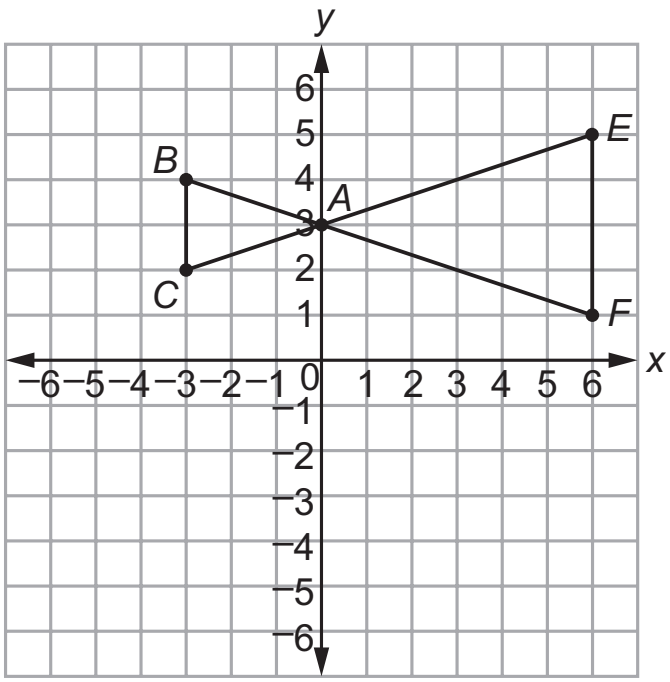
MATHEMATICS

Sample Constructed-Response Items

CONSTRUCTED-RESPONSE ITEM

G.SRT.3

1. Consider the two triangles shown.



Part A: What transformation or series of transformations maps triangle *ABC* onto triangle *AEF*? Type your answer in the space provided.

Part B: Explain why $\angle ABC$ is congruent to $\angle AEF$ and why $\angle ACB$ is congruent to $\angle AFE$. Type your answer in the space provided.

#1 Item Information

Standard: G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	**Item Depth of Knowledge:** 3 Strategic Thinking Student uses reasoning and develops a plan or sequence of steps; process has some complexity.

ITEM-SPECIFIC SCORING GUIDELINE

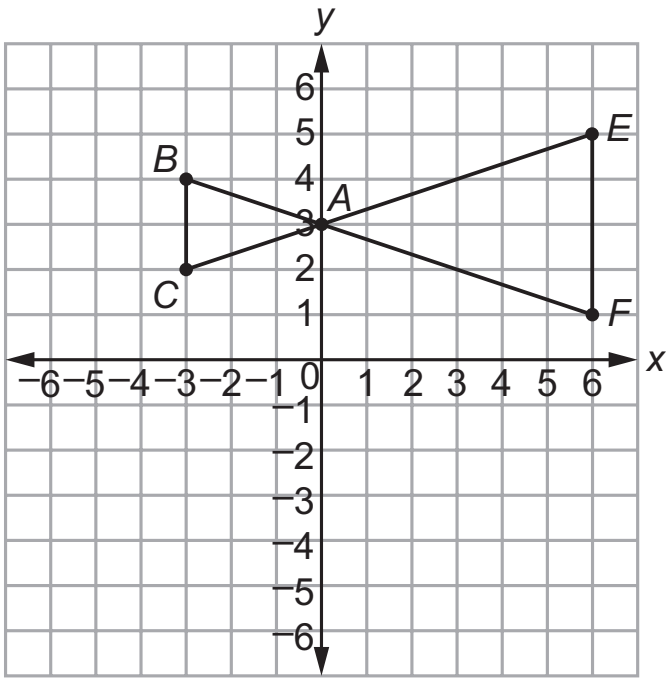
Score Point	Rationale
2	Response demonstrates a complete understanding of the standard. Give 2 points for student identifying a series of transformations that maps triangle *ABC* onto triangle *AEF* and explaining why the corresponding angles are congruent. ***Exemplar Response:*** Reflection across the *y*-axis and then dilation about point *A* by a scale factor of 2. (*1 point*) AND The dilation makes the triangles similar, and similar triangles have congruent angles. (*1 point*) OR Other valid response
1	Response demonstrates partial understanding of the standard. Student earns 1 point for answering 1 key element.
0	Response demonstrates limited to no understanding of the standard. Student earns 0 points because the student does not show understanding of establishing the AA criterion using transformation.

STUDENT RESPONSES

G.SRT.3

Response Score: 2

1. Consider the two triangles shown.



Part A: What transformation or series of transformations maps triangle *ABC* onto triangle *AEF*? Write your answer in the space provided on your answer document.

Dilation with the center at point A with a scale factor of 2 and then a reflection over the y-axis

Part B: Explain why $\angle ABC$ is congruent to $\angle AEF$ and why $\angle ACB$ is congruent to $\angle AFE$. Write your answer in the space provided on your answer document.

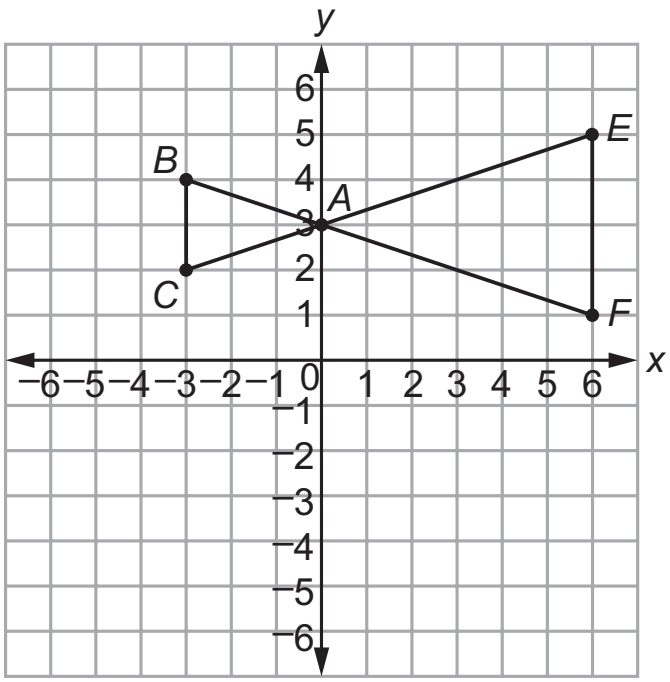
Because the triangles can be mapped onto eachother that proves they are similar and the corresponding angles are equal

The response demonstrates a complete understanding by providing a series of transformations that will map triangle *ABC* onto triangle *AEF* in Part A (dilation with a scale factor of 2 about point *A* followed by a reflection over the *y*-axis) and a correct explanation in Part B, though the student confuses "*equal*" with "*congruent.*"

G.SRT.3

Response Score: 1

1. Consider the two triangles shown.



Part A: What transformation or series of transformations maps triangle *ABC* onto triangle *AEF*? Type your answer in the space provided.

reflect triangle ABC over the y-axis and then have a dilation with the center at point A and a scale factor times 2

Part B: Explain why $\angle ABC$ is congruent to $\angle AEF$ and why $\angle ACB$ is congruent to $\angle AFE$. Type your answer in the space provided.

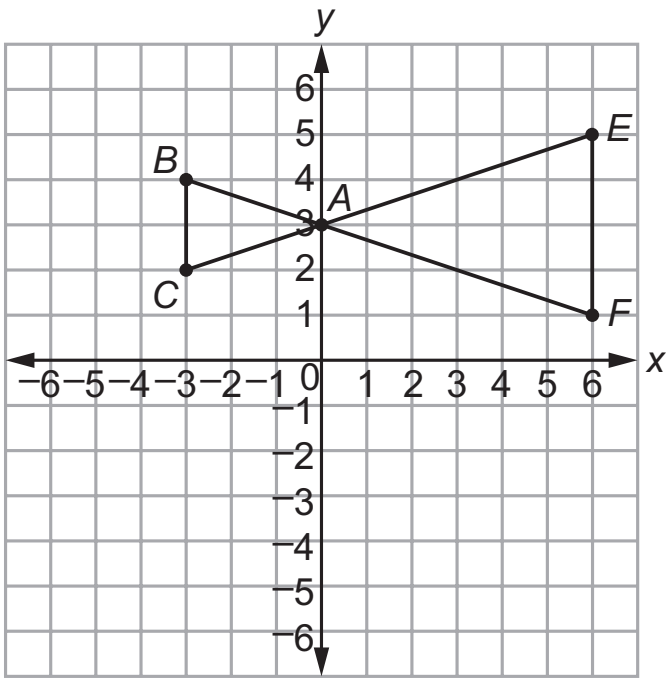
It looks the same.

The response demonstrates understanding by providing a series of transformations that will map triangle *ABC* onto triangle *AEF* in Part A (reflection over the *y*-axis followed by dilation with a scale factor of 2 about point *A*). However, the student has given an invalid explanation for Part B. The explanation "*It looks the same*" is not enough to show that the two sets of angles are congruent.

G.SRT.3

Response Score: 0

1. Consider the two triangles shown.



Part A: What transformation or series of transformations maps triangle *ABC* onto triangle *AEF*? Type your answer in the space provided.

reflect over the y-axis

Part B: Explain why ∠*ABC* is congruent to ∠*AEF* and why ∠*ACB* is congruent to ∠*AFE*. Type your answer in the space provided.

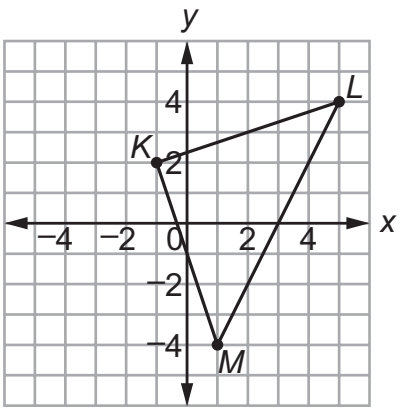
They aren't congruent. Its two different triangles, one is bigger than the other one.

The response demonstrates inadequate understanding of the concepts being measured. The response in Part A shows a single transformation (reflection over the *y*-axis) that will not map one triangle onto the other, though it is a step in the correct series of transformations. The explanation in Part B demonstrates limited understanding of the concepts being tested. Though the student has correctly stated that the two triangles are different, the conclusion that the angles are not congruent is incorrect.

EXTENDED CONSTRUCTED-RESPONSE ITEM

G.GPE.4

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Type your answer in the space provided.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Type your answer in the space provided.

#2 Item Information

Standard: G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0, 2)*. (Focus on quadrilaterals, right triangles, and circles.)	**Item Depth of Knowledge:** 3 Strategic Thinking Student uses reasoning and develops a plan or sequence of steps; process has some complexity.

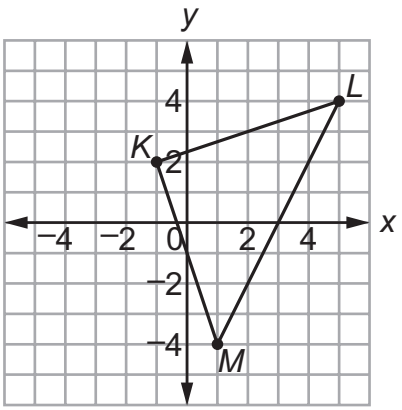
ITEM-SPECIFIC SCORING GUIDELINE

Score Point	Rationale
4	Response demonstrates a complete understanding of the standard. Give 4 points for correctly determining the side lengths of *KL* and *KM* in Part A, making a statement that clarifies that two congruent sides determine an isosceles triangle in Part A, correctly determining the slopes of *KL* and *KM* in Part B, and making a statement that demonstrates that negative reciprocal slopes for intersecting lines determines right angles in Part B. ***Exemplar Response:*** **Part A:** $KL = KM = \sqrt{40}$ (or $2\sqrt{10}$ or about 6.32). Isosceles triangles have a pair of sides that are congruent. (2 points: 1 point for correctly determining the length of two of the sides and 1 point for identifying that this triangle has two sides of equal length that make it an isosceles triangle) **NOTE:** Determining side length for *LM* will not contribute to the response score, and any mistakes made in determining side length for *LM* will not cause a deduction from the response score unless the length of *LM* is directly involved with the determination that the triangle is an isosceles triangle (e.g., if a student says *KL* = *LM*). **Part B:** Slope of *KL* = 1/3 and slope of *KM* = –3. Slopes that are negative reciprocals mean that the lines are at right angles. (2 points: 1 point for determining the slope of two of the sides and 1 point for identifying that this triangle has two sides that have negative reciprocal slopes that make it a right triangle) **NOTE:** Determining the slope for *LM* will not contribute to the response score, and any mistakes made in determining the slope for *LM* will not cause a deduction from the response score unless the slope of *LM* is directly involved with the determination that the triangle is a right triangle (e.g., if a student says *KL* / *LM* = –1).
3	Response demonstrates nearly complete understanding of the standard. Student earns 3 points for answering 3 key elements.
2	Response demonstrates partial understanding of the standard. Student earns 2 points for answering 2 key elements.
1	Response demonstrates minimal understanding of the standard. Student earns 1 point for answering 1 key element.
0	Response demonstrates limited to no understanding of the standard. Student earns 0 points because the student does not show understanding of determining distances and slopes or classifying the type of triangle.

G.GPE.4

Response Score: 4

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Type your answer in the space provided.

KL and KM are both equal to 6.32. I found this by using the distance formula. The distance for KL was the square root of $6^2 + 2^2$. KM was the same as KL. I know this triangle is isosceles because it has two sides with equal lengths.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Type your answer in the space provided.

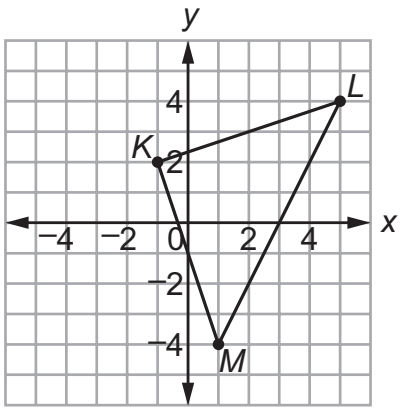
The triangle is a right triangle because KL and KM have negative reciprocal slopes. I know this because the slope of KL is 1/3 and the slope of KM is -3.

The response demonstrates complete understanding by providing the correct lengths for sides *KL* and *KM* in Part A and recognizing that since the triangle has two congruent sides, it is an isosceles triangle. In Part B, the student correctly determines the slopes of *KL* and *KM*, and accurately states that the triangle must be a right triangle because the slopes of *KL* and *KM* are negative reciprocals.

G.GPE.4

Response Score: 3

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Write your answer in the space provided on your answer document.

KL = $\sqrt{36+4}$ = $\sqrt{40}$. KM = $\sqrt{36+4}$ = $\sqrt{40}$. Because KL and KM both equal $\sqrt{40}$, the triangle must be isosceles.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Write your answer in the space provided on your answer document.

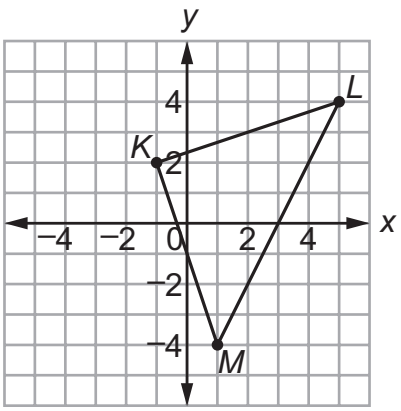
The slope of KL is 1/3. The slope of KM is -3. The slope of ML is 2. Since KL is less than 1 and ML is more than 1, the triangle is a right triangle.

The response demonstrates nearly complete understanding by providing the correct lengths for sides *KL* and *KM* in Part A and recognizing that since the triangle has two congruent sides, it is an isosceles triangle. In Part B, the student correctly determines the slopes of *KL* and *KM* and *ML*, but the relationship between *KL* and *ML* is insufficient to suggest that triangle *KLM* is a right triangle.

G.GPE.4

Response Score: 2

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Type your answer in the space provided.

The length of KL is $\sqrt{40}$. This is also the length of KM. The length of LM is $\sqrt{80}$. I know this because I used the distance formula.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Type your answer in the space provided.

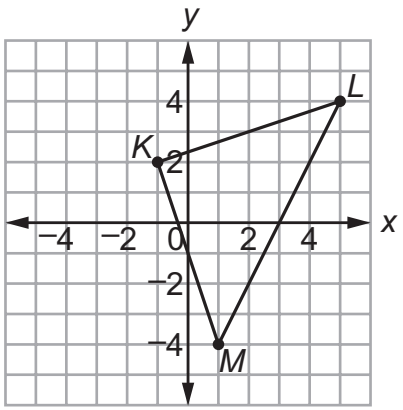
The rise over run for KM is -3/1. For KL, it is 1/3. For LM, it is 2/1.

The response demonstrates partial understanding by providing the correct lengths for sides KL and KM in Part A and the correct slopes for KL and KM in Part B. However, the response does not recognize the triangle as an isosceles triangle in Part A and does not explain why it is a right triangle in Part B. Determining the length and slope of LM does not contribute to or detract from the response's score.

G.GPE.4

Response Score: 1

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Write your answer in the space provided on your answer document.

The length of KL is 36. The length of KM is 4. The length of LM is 40. I know that triangle KLM is isosceles because all of the sides are not equal.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Write your answer in the space provided on your answer document.

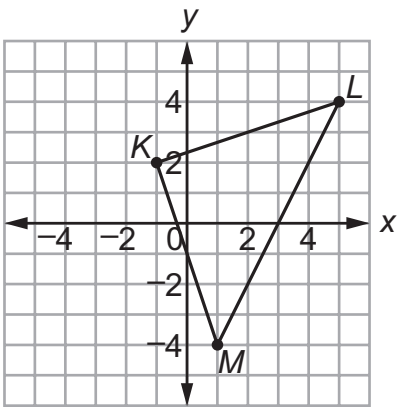
KL = $\frac{1}{3}$. KM = -3. Triangle KLM is a right triangle because the two slopes are intersecting each other.

The response demonstrates minimal understanding. The student demonstrates no understanding of isosceles triangles in Part A—the student provides incorrect side lengths and incorrectly states that triangle *KLM* is isosceles because the sides are not equal. The student demonstrates minimal understanding in Part B by providing the correct slopes for sides *KL* and *KM*; however, the explanation of why triangle *KLM* is a right triangle is insufficient.

G.GPE.4

Response Score: 0

2. Look at the coordinate grid shown below.



The vertices of $\triangle KLM$ are $K(-1, 2)$, $L(5, 4)$, and $M(1, -4)$.

Part A: Find the lengths of two of the sides, and use those lengths to prove that $\triangle KLM$ is an isosceles triangle. Type your answer in the space provided.

KL = 6.32.

Part B: Find the slopes of two of the sides, and use those slopes to prove that $\triangle KLM$ is a right triangle. Type your answer in the space provided.

The slope of KL is 8. It is a right triangle because angle K is 90 degrees.

The response demonstrates limited to no understanding. Part A shows limited understanding by providing the correct length for only one side of the triangle, without including the length of any other side. Additionally, the student makes no attempt to explain why the triangle is an isosceles triangle. The response also demonstrates limited to no understanding in Part B. The student provides an incorrect slope for *KL,* and the explanation of why triangle *KLM* is a right triangle is insufficient.

END OF SAMPLER

QUESTIONS