Georgia

Milestones

Assessment System

Geometry

Mathematics

Item and Scoring Sampler

2018

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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 types 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 End of Course (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 items are provided in this sampler, along with any related stimulus information such as a passage or graphic. Following the item is the scoring guide for the constructed-response item. The scoring guide includes the item information table, the item-specific scoring rubric, and annotated sample student responses at each score point.

For mathematics items, each item-specific scoring rubric 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

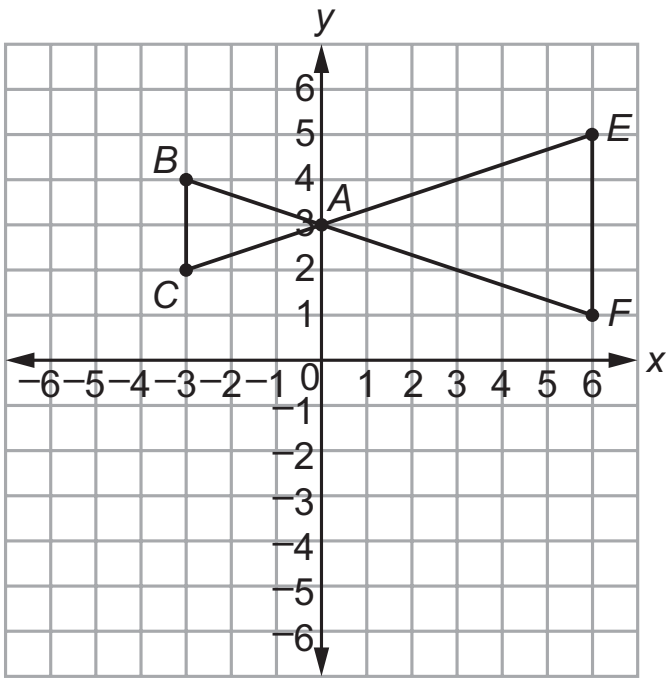
MATHEMATICS

Sample Constructed-Response Items

ITEM 1: CONSTRUCTED-RESPONSE

MGSE9-12.G.SRT.5

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.

Scoring Guide

Item 1 Information

Standard: MGSE9-12.G.SRT.5 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 RUBRIC

Score	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.

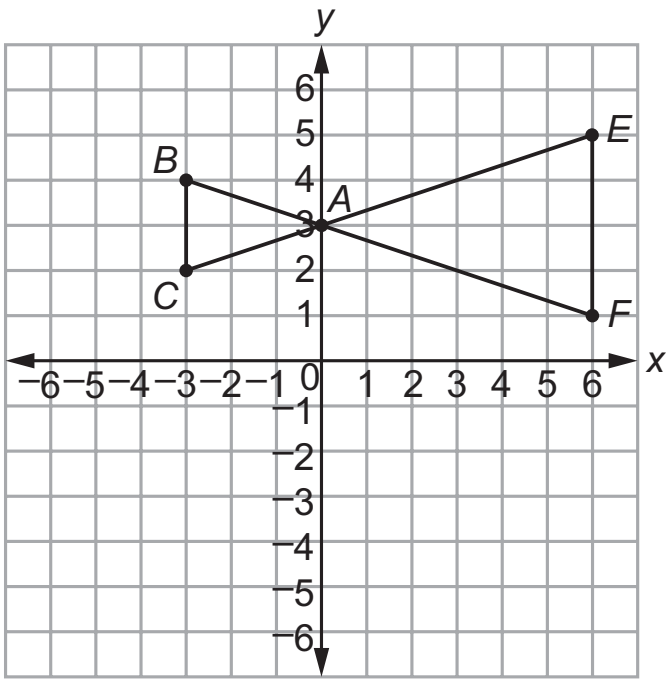
NO TEST MATERIAL
ON THIS PAGE

STUDENT RESPONSES

MGSE9-12.G.SRT.5

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.

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.

Part A

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

Part B

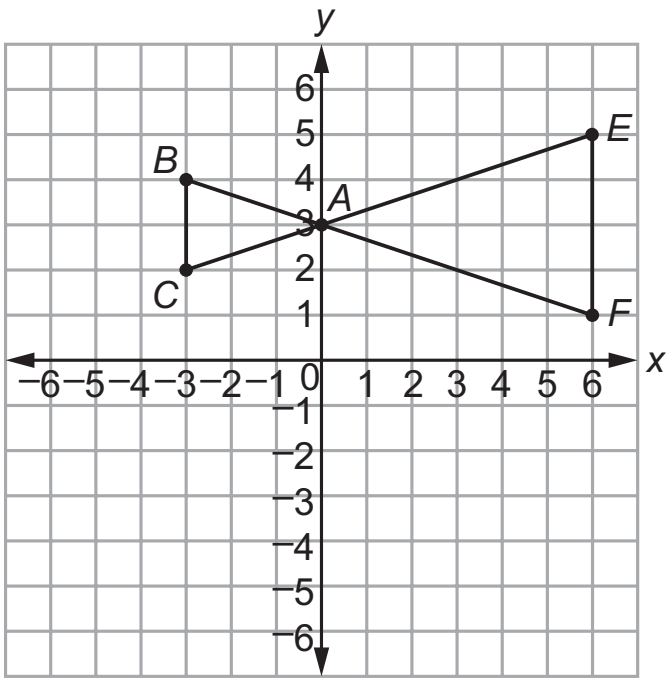
Because the triangles can be mapped onto each other that proves they are similar and the corresponding angles are equal.

The response demonstrates a complete understanding of the standard being tested. In Part A, the student correctly provides a series of transformations that will map triangle *ABC* onto triangle *AEF*. In Part B, the student correctly explains why the angles listed are congruent, although the student confuses the word equal with the word congruent.

MGSE9-12.G.SRT.5

Response Score: 2

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.

180° clockwise rotation about point A (0, 3). Dilate by a scale factor of 2 with the center at point A.

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

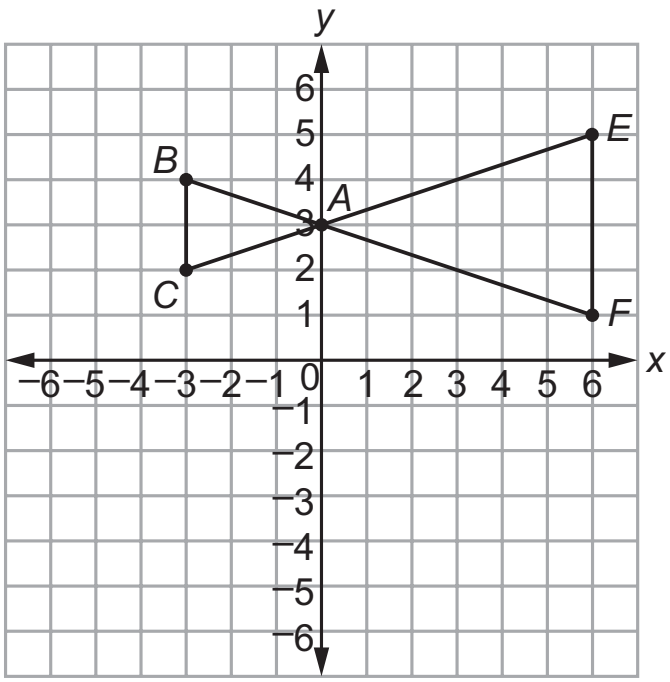
Dilating a triangle by a scale factor of 2 does not change the measurements of the angles, so ∠ABC is congruent to ∠AEF, ∠ACB is congruent to ∠AFE, as well as ∠BAC being congruent to ∠EAF.

The response demonstrates a complete understanding of the standard being tested. In Part A, the student correctly provides a series of transformations that will map triangle *ABC* onto triangle *AEF*. In Part B, the student correctly explains why the angles listed are congruent.

MGSE9-12.G.SRT.5

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.

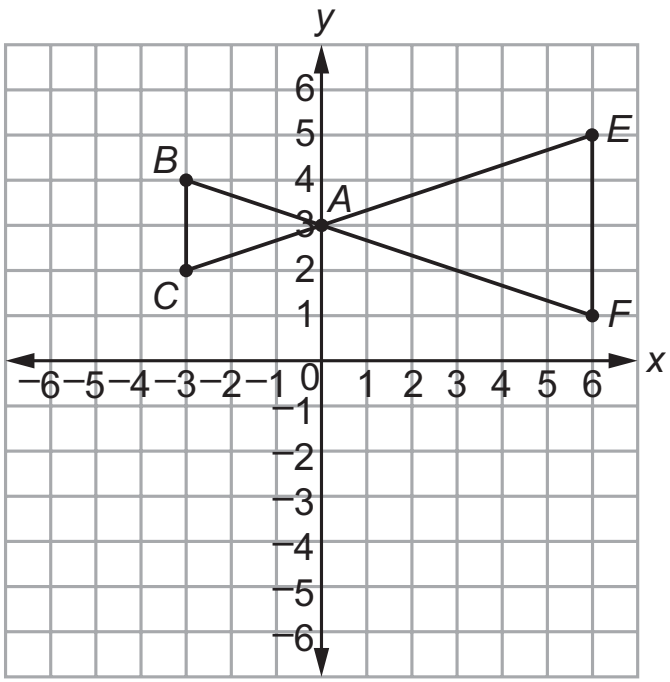
It looks the same.

The response demonstrates a partial understanding of the standard being tested. In Part A, the student correctly provides a series of transformations that will map triangle *ABC* onto triangle *AEF*. In Part B, the student incorrectly explains the reason why the angles given are congruent: "It looks the same." The response does not demonstrate complete understanding.

MGSE9-12.G.SRT.5

Response Score: 1

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.

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.

Part A

Flip it over the y-axis

Part B

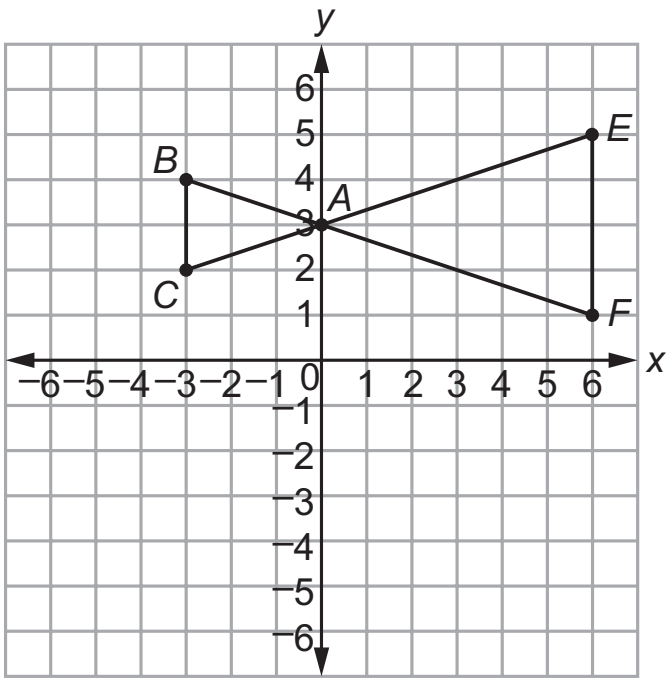
They are Congruent because the triangles have the same shape and proportions, even though they are not the same size, the angles have the same measurements

The response demonstrates a partial understanding of the standard being tested. In Part A, the student shows a single transformation, "Flip it over the *y*-axis," which is not a complete series of transformations to map triangle *ABC* onto triangle *AEF*. In Part B, the student correctly explains the congruency of the given angles.

MGSE9-12.G.SRT.5

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.

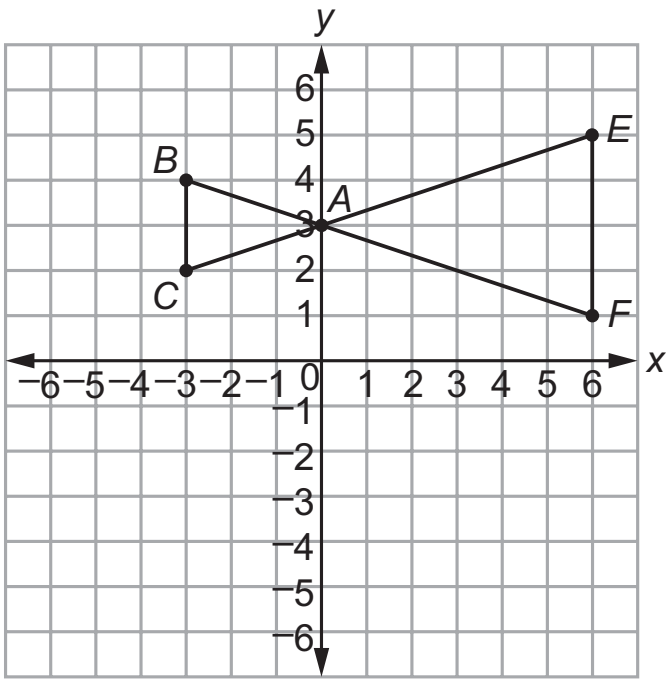
They aren't congruent. Its two different triangles, one is bigger than the other one.

The response demonstrates little to no understanding of the standard being tested. In Part A, the student shows a single transformation, "reflect over the *y*-axis," which will not map triangle *ABC* onto triangle *AEF*, though it is a step in the correct series of transformations. In Part B, the student states that "They aren't congruent," which is an incorrect response. Although it is a true statement that "one is bigger than the other," the conclusion that the angles are not congruent is incorrect.

MGSE9-12.G.SRT.5

Response Score: 0

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.

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.

Part A

rotate 90°

Part B

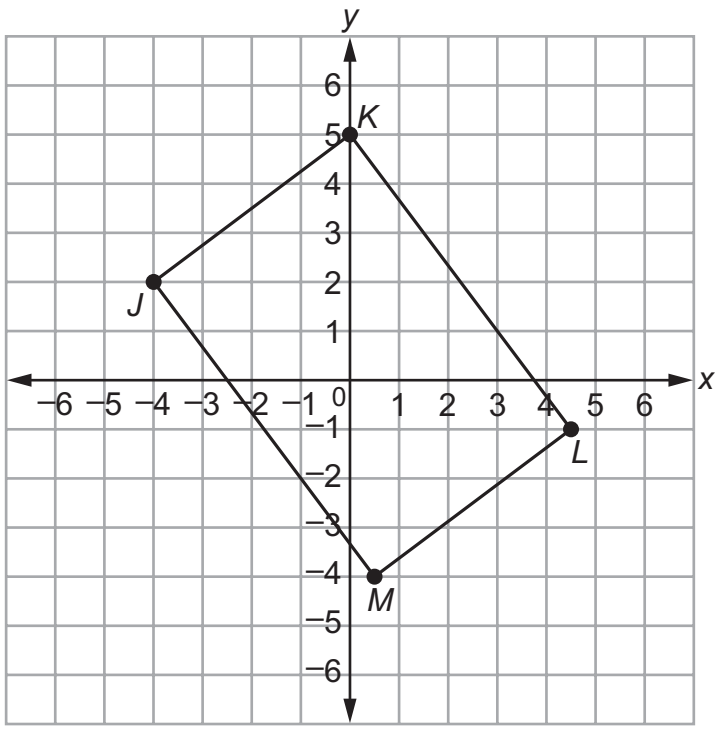
They are congruent because ∠A=∠A, ∠B=∠E and ∠C=∠F

The response demonstrates little to no understanding of the standard being tested. In Part A, the student shows an incorrect degree for rotation and is missing the dilation scale factor entirely. In Part B, the student confuses equal with congruent and does not give a valid reason for congruency.

ITEM 2: EXTENDED CONSTRUCTED-RESPONSE

MGSE9-12.G.GPE.4

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

Part B

Scoring Guide

Item 2 Information

Standard: MGSE9-12.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 RUBRIC

Score	Rationale
4	Response demonstrates a complete understanding of the standard. Give 4 points for correctly determining the side lengths of *JK* and *KL* in Part A, making a statement that clarifies that all sides of a square must be equal lengths in Part A, correctly determining the slopes of *JK* and *KL* in Part B, and making a statement that demonstrates that negative reciprocal slopes for intersecting lines determine right angles in Part B. Exemplar Response: Part A: $JK = 5$ and $KL = 7.5$ (*1 point*) **AND** Squares have equal side lengths, so *JKLM* is not a square. (*1 point*) **OR** other valid explanation Part B: Slope of *JK* is $\frac{3}{4}$ and slope of *KL* is $\frac{-4}{3}$ (*1 point*) **AND** Slopes that are negative reciprocals mean that the lines are at right angles. (*1 point*) **OR** other valid explanation
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 using coordinates to prove simple geometric theorems algebraically.

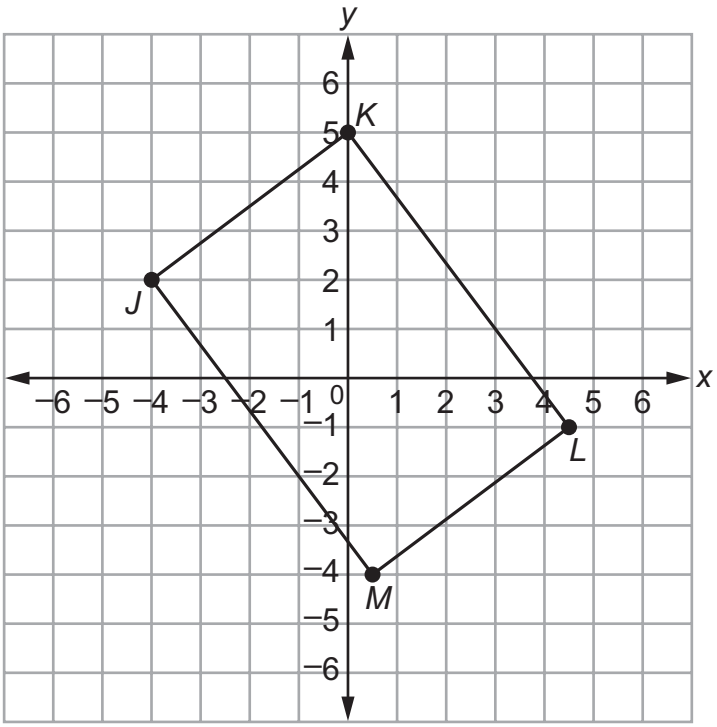
**If a student makes an error in one part that is carried through to subsequent parts, then the student is not penalized again for the same error.*

STUDENT RESPONSES

MGSE9-12.G.GPE.4

Response Score: 4

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Type your answer in the space provided.**

JK is 5 and KL is 7.5. The distance for JK was the square root of 3^2+4^2. The distance for KL was the square root of $6^2+4.5^2$. I know the shape is not a square because the side lengths need to be equal and they are not.

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

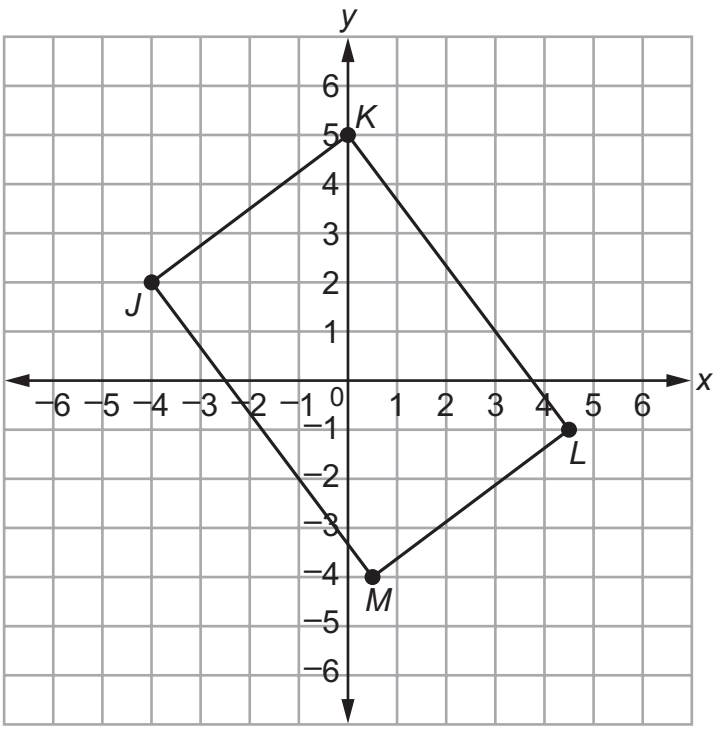
The angle is a right angle because JK and KL have negative reciprocal slopes. I know this because the slop of JK is $\frac{3}{4}$ and the slope of KL is $\frac{-4}{3}$.

The response demonstrates a complete understanding of the standard being tested. In Part A, the student correctly provides the lengths for sides *JK* and *KL* and recognizes that since the sides are different lengths, it cannot be a square. In Part B, the student correctly determines the slopes of *JK* and *KL* and accurately states that the angle must be a right angle because the slopes of *JK* and *KL* are negative reciprocals.

MGSE9-12.G.GPE.4

Response Score: 4

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

JK → $3^2+4^2=c^2$

$9+16=c^2$

$5=c$

KL → $6^2+4.5^2=c^2$

$36+20.25=c^2$

$7.5=c$

JK & KL are not the same, so it is not a square.

Part B

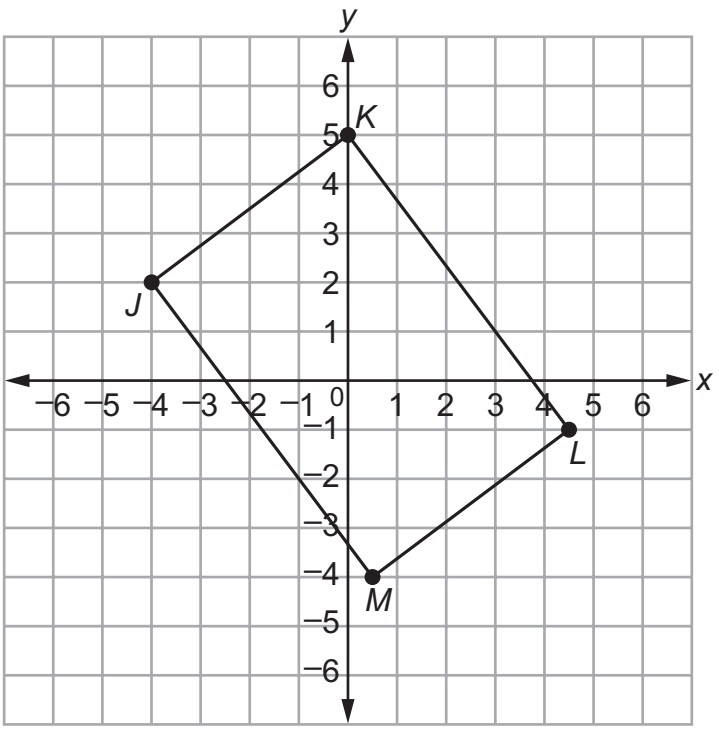
Slope is rise over run. Slope of JK = $\frac{3}{4}$. Slope of KL = $-\frac{4}{3}$. Two lines are perpendicular when their slopes are flipped and one is negative and one is positive. So ∠JKL is a right angle.

The student demonstrates a complete understanding of the standard being tested. In Part A, the student correctly provides the lengths for sides *JK* and *KL* and recognizes that since the sides are different lengths, it cannot be a square. In Part B, the student correctly determines the slopes of *JK* and *KL* and accurately states that the two lines are perpendicular and the angle is a right angle.

MGSE9-12.G.GPE.4

Response Score: 3

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

$JK = \sqrt{9+16} = \sqrt{25}$

$KL = \sqrt{36+20.25} = \sqrt{56.25}$

Because JK and KL are not the same length, the shape is not a square

Part B

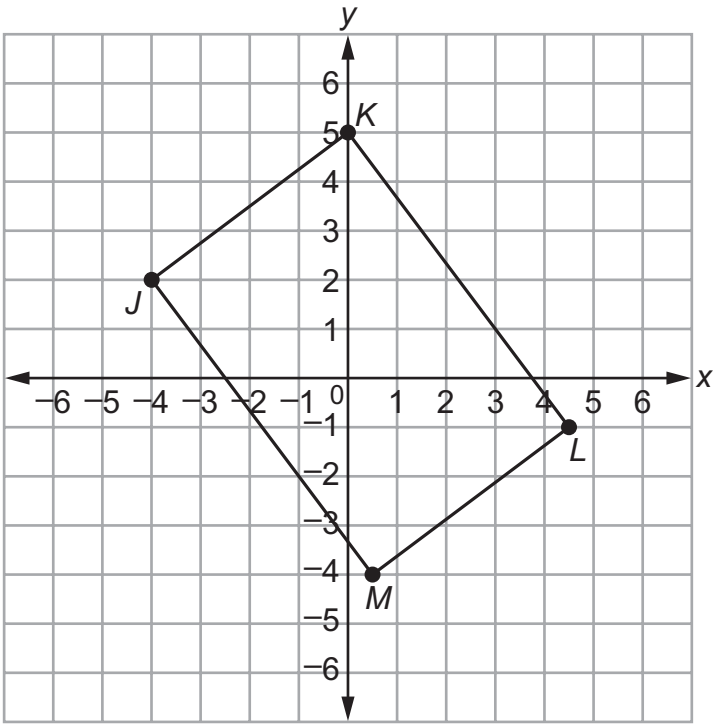
The slope of JK ~~and KL~~ is 3/4 and the slope of KL is -4/3. Since JK is less than 1 and KL is negative, $\angle JKL$ is a right angle.

The response demonstrates a nearly complete understanding of the standard being tested. In Part A, the student correctly provides the lengths for sides *JK* and *KL* and recognizes that since the sides are not equal lengths, the shape is not a square. In Part B, the student correctly determines the slopes of *JK* and *KL*; however, the relationship between *JK* and *KL* is insufficient to suggest that angle *JKL* is a right angle.

MGSE9-12.G.GPE.4

Response Score: 3

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Type your answer in the space provided.**

JK=√(9+16)=√25 =5, KL=√(36+20.25)=√56.25=7.5

Part B Find the slopes of two of the sides, and use those slopes to prove that ∠*JKL* is a right angle. **Type your answer in the space provided.**

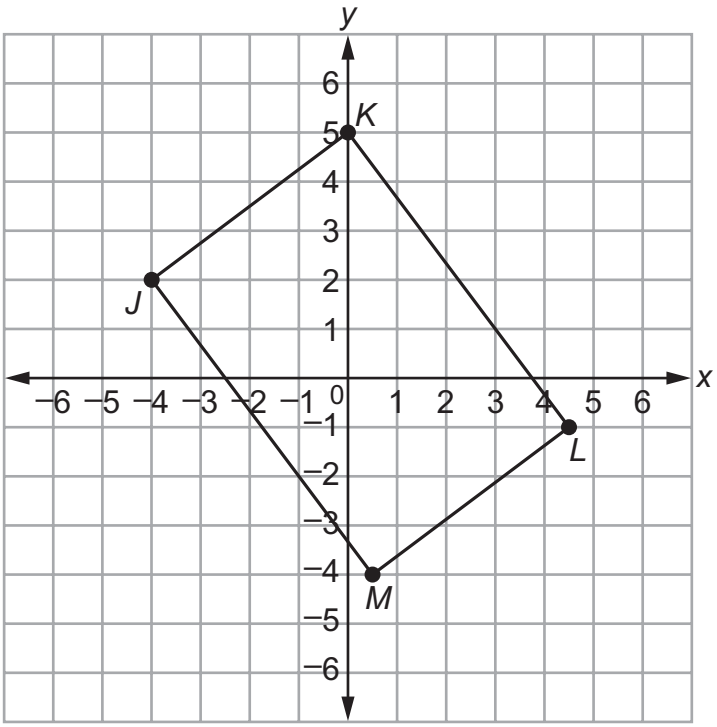
Slope of JK is $\frac{3}{4}$. Slope of KL is $\frac{-4}{3}$. If you flip the slope of JK and add a negative sign you get the slope of KL. So the two lines make a right angle at ∠JKL.

The student demonstrates a nearly complete understanding of the standard being tested. In Part A, the student correctly provides the side lengths for sides *JK* and *KL* but does not explain why the shape is not a square. In Part B, the student correctly gives the slopes of *JK* and *KL* and gives a valid explanation for why the angle *JKL* is a right angle.

MGSE9-12.G.GPE.4

Response Score: 2

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Type your answer in the space provided.**

The length of JK is 5. The length of KL is 7.5. 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 $\angle JKL$ is a right angle. **Type your answer in the space provided.**

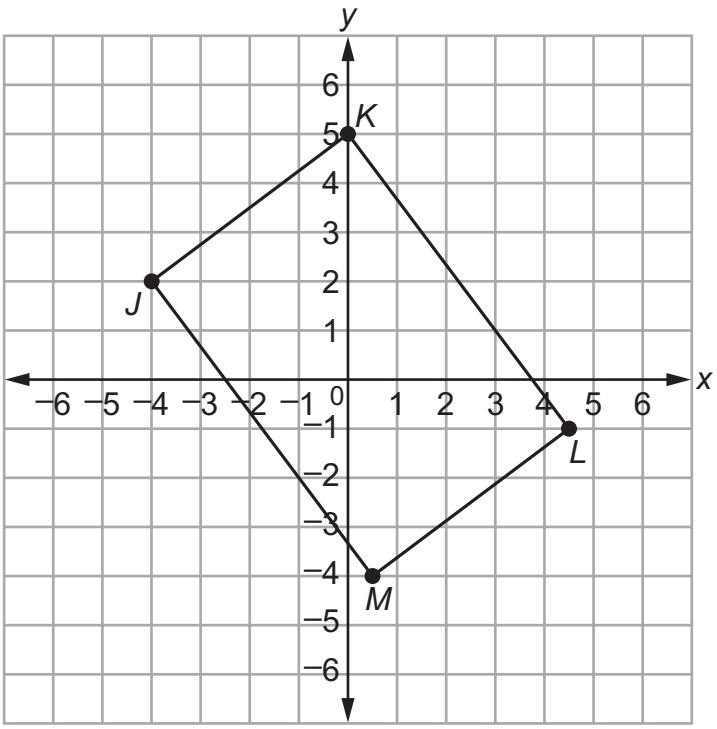
The rise over run for JK is $\frac{3}{4}$. For KL it is $\frac{-4}{3}$.

The response demonstrates a partial understanding of the standard being tested. In Part A, the student correctly provides the lengths for sides *JK* and *KL* but does not state why the shape is not a square. In Part B, the student correctly states the slopes for *JK* and *KL* but does not address why the angle is a right angle.

MGSE9-12.G.GPE.4

Response Score: 2

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

JK = 6 KL = 9
The sides aren't the same,
So it is not a square

Part B

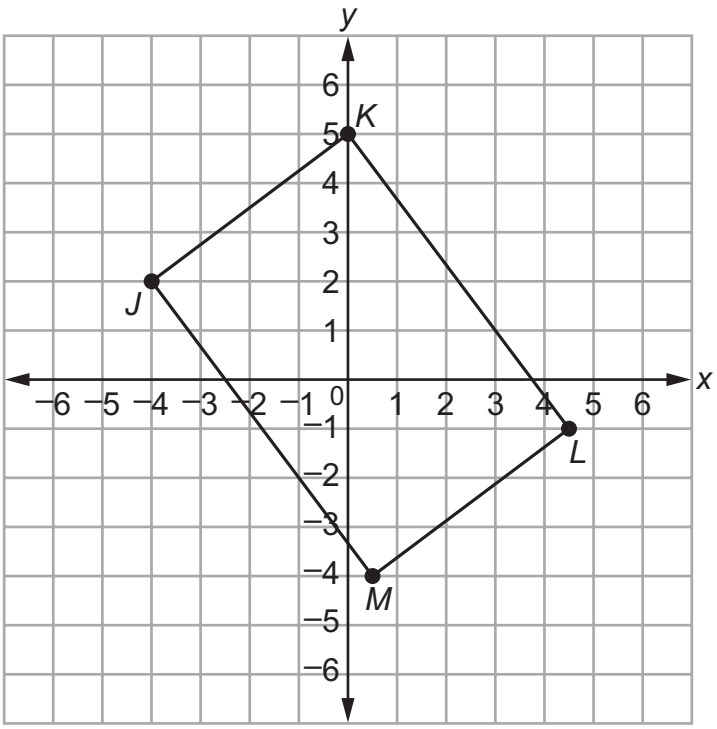
Rise over run for JK is $\frac{3}{4}$
Rise over run for KL is $\frac{-4}{3}$

The response demonstrates a partial understanding of the standard being tested. In Part A, the student correctly states that the shape is not a square but incorrectly determines the lengths of sides *JK* and *KL*. In Part B, the student correctly states the "Rise over run" for sides *JK* and *KL* but does not use those slopes to prove the angle is a right angle.

MGSE9-12.G.GPE.4

Response Score: 1

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

The length of KL is 56.25.
The length of JK is 25.
I know the shape is not a square because the sides are all straight lines

Part B

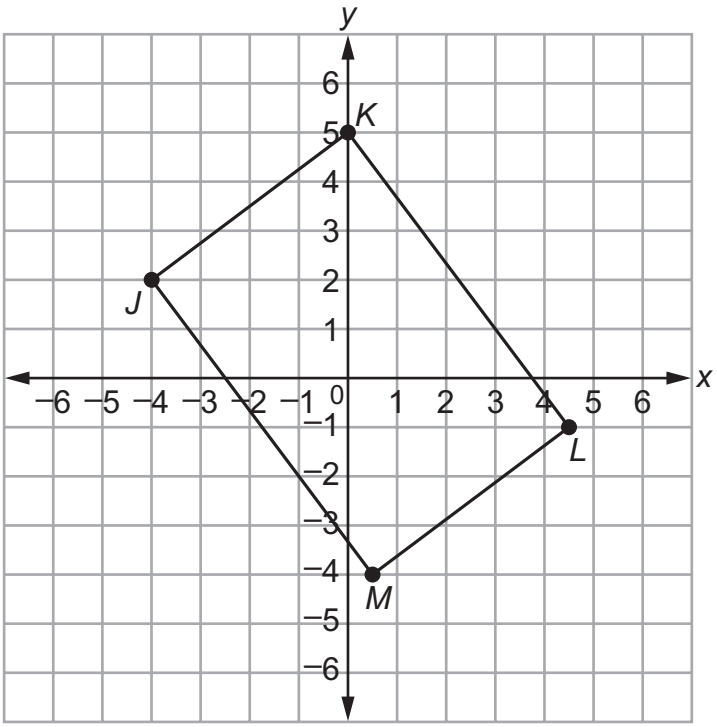
$KL = -4/3$
$JK = 3/4$
It is a right angle because the two slopes are intersecting each other.

The response demonstrates a minimal understanding of the standard being tested. In Part A, the student correctly states that the shape is not a square but demonstrates no understanding of the properties of a square. The side lengths given are also incorrect. In Part B, the student correctly provides the slopes for sides *JK* and *KL*; however, the explanation of why angle *JKL* is a right angle is insufficient.

MGSE9-12.G.GPE.4

Response Score: 1

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Type your answer in the space provided.**

JK is 5 and KL is 7.5

Part B Find the slopes of two of the sides, and use those slopes to prove that ∠*JKL* is a right angle. **Type your answer in the space provided.**

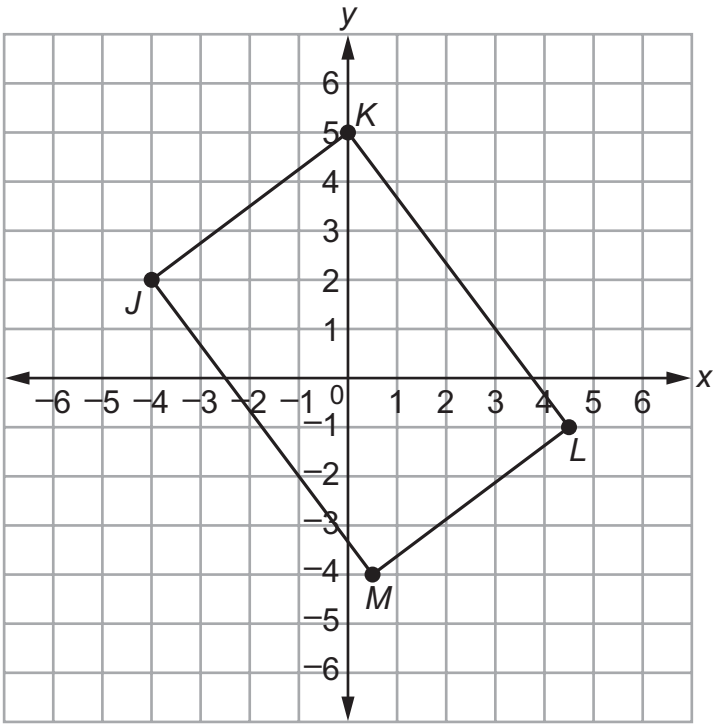
JK is 5 and KL is 7.5, so the slopes are not equal. ∠JKL is not a right angle

The response demonstrates a minimal understanding of the standard being tested. In Part A, the student correctly provides the side lengths of sides *JK* and *KL*, but no statement is given for the shape not being a square. In Part B, the student provides incorrect slopes, and the explanation of why angle *JKL* is a right angle is insufficient.

MGSE9-12.G.GPE.4

Response Score: 0

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Type your answer in the space provided.**

JK=5

Part B Find the slopes of two of the sides, and use those slopes to prove that ∠*JKL* is a right angle. **Type your answer in the space provided.**

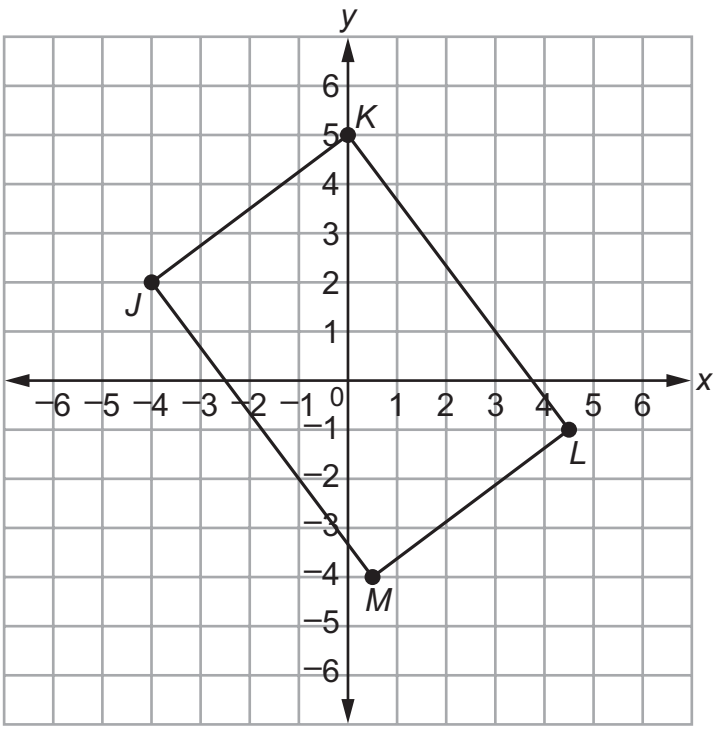
The slope of KL is 8. It is a right angle because angle K is 90 degrees.

The response demonstrates little to no understanding of the standard being tested. In Part A, the student correctly gives the length of side *JK* but is missing a second side length. The student also does not give sufficient proof that the shape is not a square. In Part B, the student provides an incorrect slope for side *KL* and insufficient proof that angle *JKL* is a right angle.

MGSE9-12.G.GPE.4

Response Score: 0

2. Look at the coordinate grid.



The vertices of the quadrilateral are $J(-4, 2)$, $K(0, 5)$, $L(4.5, -1)$, and $M(0.5, -4)$.

Part A Find the lengths of two of the sides, and use those lengths to prove that *JKLM* is NOT a square. **Write your answer in the space provided on your answer document.**

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

Part A

it is a rectangle

Part B

∠JKL might be a right angle

The response demonstrates little to no understanding of the standard being tested. In Part A, the student provides no side lengths and no explanation as to why the shape "is a rectangle." In Part B, the student does not provide slopes and gives no explanation for angle *JKL* being a right angle.