2025 MCAS Sample Student Work and Scoring Guide

Grade 8 Mathematics
Question 16: Constructed-Response

Reporting Category: Geometry
Standard: 8.G.A.1 - Verify experimentally the properties of rotations, reflections, and translations.
Item Description: Given a polygon and its image after a transformation, verify congruence by analyzing properties of both polygons and describe a series of transformations that would result in the same image of the polygon.
Calculator: Allowed

This item can be found in the released item sets on the MCAS Resource Center.

Scoring Guide
Select a score point in the table below to view the sample student response.

Score*	Description
4A **4B**	The student response demonstrates an exemplary understanding of the Geometry concepts involved in verifying experimentally the properties of rotations, reflections, and translations. The student describes a series of transformations that can be used to show that two figures are congruent.
3	The student response demonstrates a good understanding of the Geometry concepts involved in verifying experimentally the properties of rotations, reflections, and translations. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result the response merits 3 points.
2	The student response demonstrates a fair understanding of the Geometry concepts involved in verifying experimentally the properties of rotations, reflections, and translations. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Geometry concepts involved in verifying experimentally the properties of rotations, reflections, and translations.
0	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in verifying experimentally the properties of rotations, reflections, and translations to merit any points.

*Letters are used to distinguish between sample student responses that earned the same score (e.g., 4A and 4B).

Score Point 4A

This question has four parts.

Kirsten rotated quadrilateral $QRST$ 180° clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.

Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

> Kirsten rotated quadrilateral QRST at about (0,0). Both quadrilaterals are the same distance away from (0,0)

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

> Angle Q is congruent to $\angle$ W. Since the two angles are in the same spot on the quadirlateral and the shape neither changed its size or shape, angles $\angle$ Q and $\angle$ W are congruent.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ≔ ≣ ⫤ ⫧ ≣ MATH ᴬᴮꟲ
Line segment $\overline{WX}$ is congruent to $\overline{QR}$. Both line segments are the shortest on their quadrilateral. Since the quadrilateral didn't change shape or size, line segments $\overline{WX}$ and $\overline{QR}$ are congruent.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

↶ ↷ **B** *I* U ≔ ≣ ⫤ ⫧ ≣ MATH ᴬᴮꟲ
Kirsten could first rotate quadrilateral WXYZ 180 ° on point Y. Then, she could translate it 10 units up. After she could translate it to the left 2 units. This would make quadrilateral WXYZ and quadrilateral QRST have the same coordinates at their vertices.

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Score Point 4B

This question has four parts.

Kirsten rotated quadrilateral $QRST$ 180° clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.
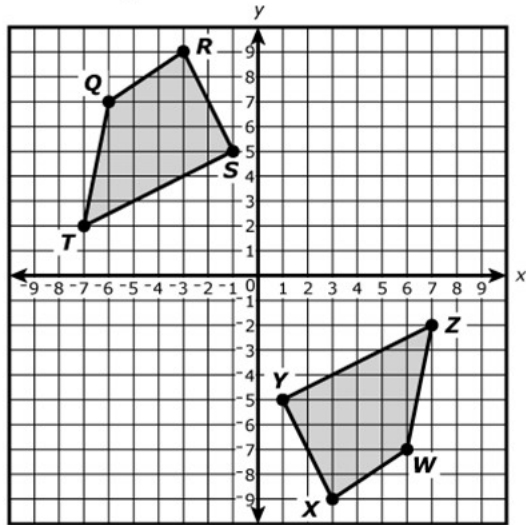
Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

↶ ↷ **B** *I* U ≔ ≣ ⫤ ⫣ ≡ MATH ᴬᴮꟲ
Kirsten rotated quadirlateral QRST about the origin.

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

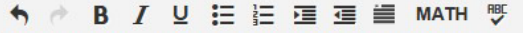Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ≔ ≣ ⫤ ⫣ ≡ MATH ᴬᴮꟲ
∠ Q in quadrilateral QRST is congruent to ∠ W in quadrilateral WXYZ because it occupies the corresponding position in a congruent figure.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

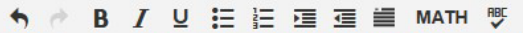Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☰ ☰ ☰ ☰ MATH ᴬᴮꟲ
$\overline{WX}$ in quadrilateral WXYZ is congruent to $\overline{QR}$ in quadrilateral QRST because it occupies a position in quadrilateral WXYZ that corresponds with the position of $\overline{QR}$ in quadrilateral QRST.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

| ↶ ↷ **B** *I* U ☰ ☰ ☰ ☰ ☰ MATH ᴬᴮꟲ |
|---|
| Since a rotation can be expressed as two reflections, in order to transform quadrilateral WXYZ so that its image has vertices with the same coordinates as quadrilateral QRST, Kristen can reflect quadrilateral WXYZ first over the x-axis, and then over the y-axis. |

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Score Point 3

This question has four parts.

Kirsten rotated quadrilateral $QRST$ $180°$ clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.
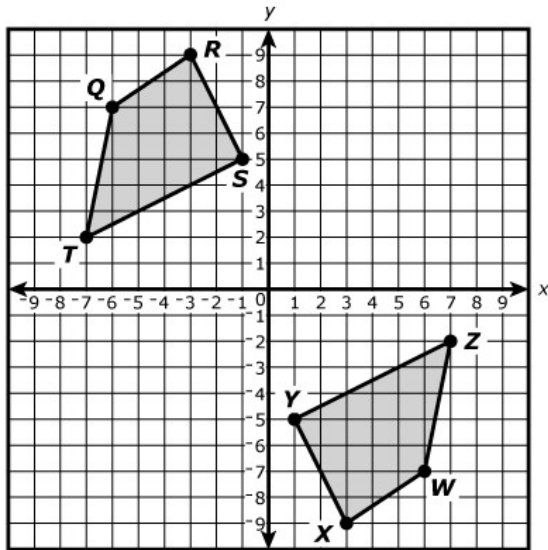
Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

↶ ↷ **B** *I* U ☰ ☷ ☲ ☲ ☰ MATH ᴬᴮᶜ
Kirsten rotated quadrilateral QRST around point (0,0).

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☷ ☲ ☲ ☰ MATH ᴬᴮᶜ
Angle $\angle W$ in quadrilateral WXYZ is congruent to angle $\angle Q$ in QRST. I know this because the order of the angles must be the same and if the image were to be flipped or ratated back then the two points would align.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☲ ☲ ☲ ☰ MATH ᴬᴮᵍ
Line segment $\overline{WX}$ is congruent to line segment $\overline{QR}$. They are congruent because they are the same order in the names and when rotated they align.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☲ ☲ ☲ ☰ MATH ᴬᴮᵍ
Kristen can rotate quadrilateral WXYZ 180 ° counter clockwise or clockwise around point (0,0) to get all the same coordinates as quadrilateral QRST.

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Score Point 2

This question has four parts.

Kirsten rotated quadrilateral $QRST$ 180° clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.

Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

| ↶ ↷ | **B** | *I* | U | ☰ | ☰ | ☲ | ☲ | ☰ | MATH | ᴿᴮᶜ |
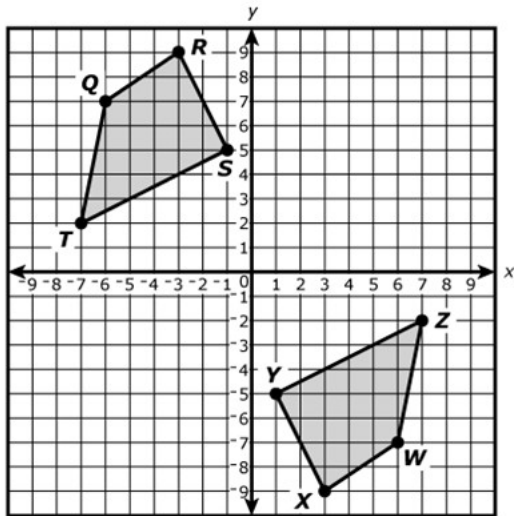
Point T (-7, 2)

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

| ↶ ↷ | **B** | *I* | U | ☰ | ☰ | ☲ | ☲ | ☰ | MATH | ᴿᴮᶜ |

Q because WXYZ is the same shape as QRST so that means WXYZ ≅ QRST and since W and Q are corresponding angles, they are congruent.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☰ ☲ ☲ ☰ MATH ABC
WX because WXYZ ≅ QRST so the corresponding segments WX and QR are congruent.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

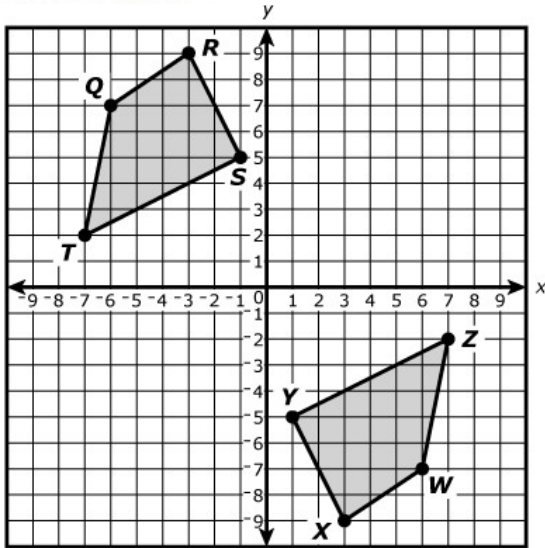Enter your answer and your work or explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☰ ☲ ☲ ☰ MATH ABC
Rotate WXYZ counter clockwise 180° , move it 10 units to the right move it 11 units up.

Score Point 1

This question has four parts.

Kirsten rotated quadrilateral $QRST$ 180° clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.

Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

↶ ↷ **B** *I* U ☰ ☰ ☰ ☰ ☰ MATH ABC
At a 180° angle point.

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ☰ ☰ ☰ ☰ ☰ MATH ABC
Angle R is congruent to $\angle W$ in quadrilateral WXYZ because it is the same size and shape as $\angle W$.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

↶ ↷ **B** *I* U ≡ ≡ ≡ ≡ ≡ MATH ᴬᴮꟼ
The line segment $\overline{XW}$ is congruent to $\overline{QR}$. If quadrilateral WXYZ was to be rotated 180 ° , it would have the same position as QRST and $\overline{XW}$ would be congruent.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.
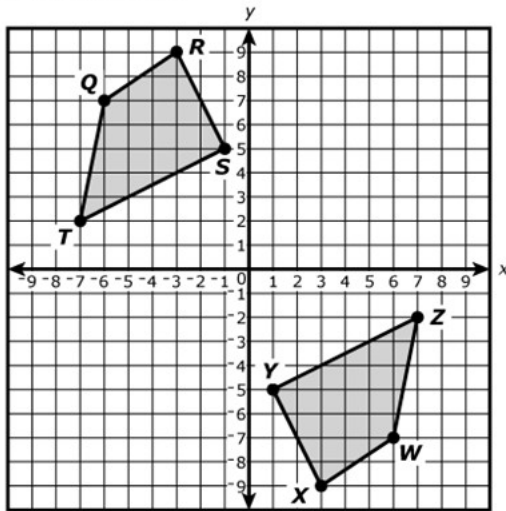
↶ ↷ **B** *I* U ≡ ≡ ≡ ≡ ≡ MATH ᴬᴮꟼ
Kirsent can rotate, flip, and reflect. These are some things Kirsten can do to have the vertices of WXYZ have the same coordinates as quadrilateral QRST.

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Score Point 0

This question has four parts.

Kirsten rotated quadrilateral $QRST$ 180° clockwise to create its image, quadrilateral $WXYZ$, as shown on this coordinate plane.

Part A

About which point did Kirsten rotate quadrilateral $QRST$?

Enter your answer in the space provided.

Kirsten rotated the quadrilaterals at point (-6, 9) and (-7, 5)

Part B

Which angle in quadrilateral $QRST$ is congruent to $\angle W$ in quadrilateral $WXYZ$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

The angle is an acute angle. I would say this because its not a right angle its more slanted.

Part C

Which line segment in quadrilateral $WXYZ$ is congruent to line segment QR in quadrilateral $QRST$? Explain your reasoning.

Enter your answer and your explanation in the space provided.

| ↶ ↷ | **B** *I* U | ≔ ≔ ≔ ≔ ≣ | MATH | ABC |

Parallel lines because they both have it.

Part D

Describe a **series** of transformations Kirsten can perform on quadrilateral $WXYZ$ so that its image has vertices with the same coordinates as quadrilateral $QRST$. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

| ↶ ↷ | **B** *I* U | ≔ ≔ ≔ ≔ ≣ | MATH | ABC |

I would say this type of transformation is reflection because is the same exact shape only that its different letters and different points. Kristen can also do a transformation of rotation.

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