2022 MCAS Sample Student Work and Scoring Guide

Grade 8 Mathematics
Question 12: Constructed-Response

Reporting Category: Geometry
Standard: 8.G.A.5 - Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
Item Description: Use facts about the angle sum of triangles to calculate angle measures and determine whether two triangles are similar.
Calculator: Allowed

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

Score*	Description
4A	The student response demonstrates an exemplary understanding of the Geometry concepts involved in using informal arguments to establish facts about the angle sum and exterior angle of triangles and the angle-angle criterion for similarity of triangles. The student finds missing angle measures in a diagram and determines whether two triangles in the diagram are similar.
4B	
3	The student response demonstrates a good understanding of the Geometry concepts involved in using informal arguments to establish facts about the angle sum and exterior angle of triangles and the angle-angle criterion for similarity of triangles. 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 using informal arguments to establish facts about the angle sum and exterior angle of triangles and the angle-angle criterion for similarity of triangles. 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 using informal arguments to establish facts about the angle sum and exterior angle of triangles and the angle-angle criterion for similarity of triangles.
0	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in using informal arguments to establish facts about the angle sum and exterior angle of triangles and the angle-angle criterion for similarity of triangles. As a result, the response does not 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.
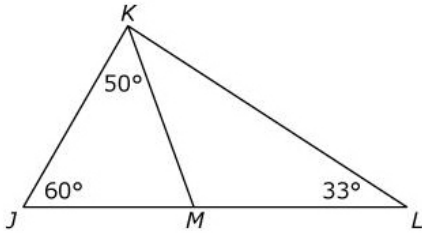
This figure is composed of triangles JKL, JKM, and KML.

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is $50°$,
- the measure of $\angle KJM$ is $60°$, and
- the measure of $\angle KLM$ is $33°$.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

> The measure of $\angle JMK$ is $70°$. I know this because the total sum of the degrees in a triangle must be $180°$ and if the sum of the known angles is $110°$ and $180 - 110 = 70$ then $\angle JMK$ must be $70°$.

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

> The sum of the measures of $\angle JMK$ and $\angle KML$ is $180°$. I know this because the angles are supplimentary because any angle in a triangle is supplementary to its exterior angle, and supplementary angles add up to be $180°$.

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

> $\angle MKL$ is $37°$. I got this answer because the sum of $\angle KML$ and $\angle MLK$ is $143°$ and the sum of all the angles in a triangle must add up to $180°$

Part D

Is triangle JKL similar to triangle KML? Explain your reasoning.

Enter your answer and your explanation in the space provided.
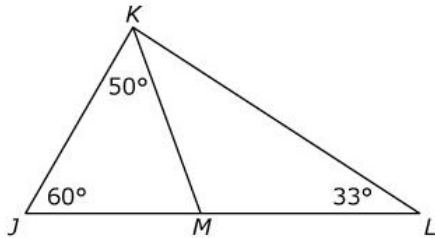
$\triangle JKL$ is not similar to $\triangle KML$ because it does not follow the AA similarity postulate and we do not have enough information to apply SSS or SAS similarity theorems.

Score Point 4B

This question has four parts.

This figure is composed of triangles JKL, JKM, and KML.

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is $50°$,
- the measure of $\angle KJM$ is $60°$, and
- the measure of $\angle KLM$ is $33°$.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

The measure of $\angle JMK$ is $70°$. I know this because I know all of the angles in a triangle add up to a total of $180°$. Because I see that $\angle JMK$ is a part of $\triangle JKM$, and the other two angles in $\triangle JKM$ are $50°$ and $60°$, I know that if I add 50+60, which equals 110, and subtract that from 180, which would be $70°$, that would be the $m\angle JMK$.

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

The sum of the measure of $\angle JMK$ and $\angle KML$ would be a total of $180°$. I know this because two angles that form a straight line will always have angles that measure up to be $180°$. And because I see that $\angle JMK$ and $\angle KML$ form a straight line, I know that their angle measures will add up to $180°$.

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

The measure of $\angle MKL$ is a total of $37°$. I know this because I also know that $m\angle JMK$ is $70°$, so $m\angle KML$ must be $110°$ because $m\angle JMK$ and $m\angle KML$ are equal to $180°$. Then I knew that all the angle measures of a triangle add up to $180°$, and because the two angles in $\triangle KML$ are $33°$ and $110°$, the last angle in that triangle, $\angle MKL$, must be equal to $37°$.

Part D

Is triangle JKL similar to triangle KML? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Triangle JKL is not similar to triangle KML. I know this because for two triangles to be similar, at least two of their angles must be the same. In $\triangle KML$, the angles are $33°$, $37°$, and $110°$. In $\triangle JKL$, the angles are $33°$, $87°$, and $60°$. Because the angles in these triangles are not the same, they are not similar.

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Score Point 3

This question has four parts.
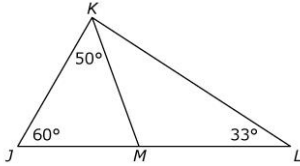
This figure is composed of triangles JKL, JKM, and KML.

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is $50°$,
- the measure of $\angle KJM$ is $60°$, and
- the measure of $\angle KLM$ is $33°$.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

> In order to find the answer I set up the equation $60° + 50° + m° = 180°$. When you are finding the measure of angles in a triangle they must all add up to $180°$ so in order to find m I subtracted $60° + 50°$ which is $110°$ from $180°$ and got $70°$.
> $\angle JMK = 70°$.

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

> $180°$ because $\angle JMK = 70°$ and $\angle KML = 110°$ and $70° + 110° = 180°$. The reason I know $\angle KML$ is $110°$ is because when there is a straight line its angle is always $180°$. And $\angle JML = 180°$ so I just added the two angles together and got $180°$.

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

> $\angle MKL = 37°$ because $\angle LMK = 110°$ and $\angle KLM = 33°$
> $110° + 33° = 143°$
> $180 - 143 = 37$
> $\angle MKL = 37°$

Part D

Is triangle JKL similar to triangle KML? Explain your reasoning.
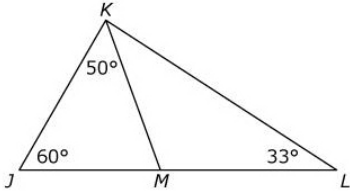
Enter your answer and your explanation in the space provided.

> Yes because they are both obtuse triangles they are both the biggest angles in their triangle.

Score Point 2

This question has four parts.

This figure is composed of triangles JKL, JKM, and KML.

K
50°
60°   33°
J   M   L

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is 50°,
- the measure of $\angle KJM$ is 60°, and
- the measure of $\angle KLM$ is 33°.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

> **70˚**
>
> I got my answer by adding 50 and 60 and then subtracting it from 180.

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

> **213˚**
>
> I got my answer by first finding out what the angle m was. Then, I added the angles together to get my answer.

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

> **37˚**
>
> I got my answer by adding 33 to 110, which is the angle I got from a previous part. Then, I subtracted the answer from 180 to get my final answer.

Part D

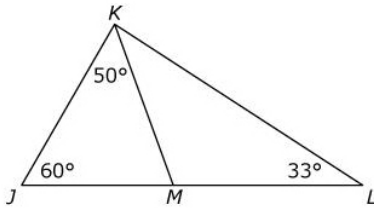Is triangle JKL similar to triangle KML? Explain your reasoning.

Enter your answer and your explanation in the space provided.

> No, both triangles are not similar. They are two different types of triangles.

Score Point 1

This question has four parts.

This figure is composed of triangles JKL, JKM, and KML.

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is $50°$,
- the measure of $\angle KJM$ is $60°$, and
- the measure of $\angle KLM$ is $33°$.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

> $\angle JMK$ is $60°$ because it is equal with $\angle KJM$

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

> The sum of $\angle JMK$ and $\angle KML$ is $180°$ becuase together they make a straight line

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

> $\angle MKL$ is $33°$ becuase it is equal to $\angle KLM$

Part D

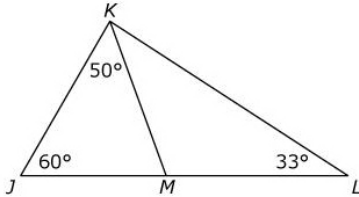Is triangle JKL similar to triangle KML? Explain your reasoning.

Enter your answer and your explanation in the space provided.

> triangle JKL and KML are similiar

Score Point 0

This question has four parts.

This figure is composed of triangles JKL, JKM, and KML.

In the figure,

- point M lies on side JL,
- the measure of $\angle JKM$ is $50°$,
- the measure of $\angle KJM$ is $60°$, and
- the measure of $\angle KLM$ is $33°$.

Part A

What is the measure, in degrees, of $\angle JMK$? Show or explain how you got your answer.

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

> To find the measure I subtracted $60°$ and $33°$ and got $27°$. So the measure of JMK in degrees is $27°$.

Part B

What is the sum of the measures, in degrees, of $\angle JMK$ and $\angle KML$? Show or explain how you got your answer.

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

> The sum of JMK and KML is 100. This is becasue the degree of JMK is $27°$ and KML is $73°$ which adds up to $100°$.

Part C

What is the measure, in degrees, of $\angle MKL$? Show or explain how you got your answer.

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

> The measure is 90. This is because one side of K is $50°$ and in order to equal $90°$ you have to add $40°$, so that is the measure of MKL.

Part D

Is triangle JKL similar to triangle KML? Explain your reasoning.

Enter your answer and your explanation in the space provided.

> Yes. They are almost the same. This is because the measure of both is withen $10°$. This is because they are both measures of K and add up to $90°$.

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