2022 MCAS Sample Student Work and Scoring Guide

Grade 7 Mathematics
Question 15: Constructed-Response

Reporting Category: Geometry
Standard: 7.G.B.5 - Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write simple equations and use them to solve for an unknown angle in a figure.
Item Description: Use facts about angles to write and solve equations that can be used to find the measures of unknown angles in a diagram.
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 **4B**	The student response demonstrates an exemplary understanding of the Geometry concepts involved in using facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
3	The student response demonstrates a good understanding of the Geometry concepts involved in using facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. 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 facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. 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 facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
0	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in using facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. 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.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.
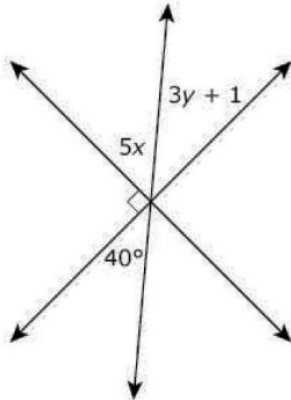
Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

> Based on the diagram, an algebraic equation that can be used to find the value of x is $40 + 90 + 5x = 180$. I got this answer because I know that a straight line has an angle of $180°$, so all the angles that form a straight line have to add up to $180°$. I also know that a square in an angle means it's $90°$. Using this information I made an equation to find the value of x. I used the $40°$ angle, the $90°$ angle, and the angle that equals 5x, and since they all make a straight line, I made the equation equal $180°$.

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

> $40 + 90 + 5x = 180$
> $130 + 5x = 180$
> $-130 \qquad\qquad -130$
> $5x = 50$
> $\frac{5x}{5} = \frac{50}{5}$
> $x = 10$

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

> Based on the diagram, an algebraic equation that can be used to find the value of y is $90 + 5(10) + 3y + 1 = 180$. I got this answer because I know an angle with a square is $90°$. Also, since I figured out the value of x in the previous question, I know that the angle 5x = 5(10). Another thing I know is that a straight line has a measure of $180°$, so I found angles that made a straight line. Using all this, I made this equation.

Part D

Use your equation from Part C to determine the value of y. Show or explain how you got your answer.

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

$$90 + 5\,(10) + 3y + 1 = 180$$
$$90 + 50 + 3y + 1 = 180$$
$$140 + 3y + 1 = 180$$
$$141 + 3y = 180$$
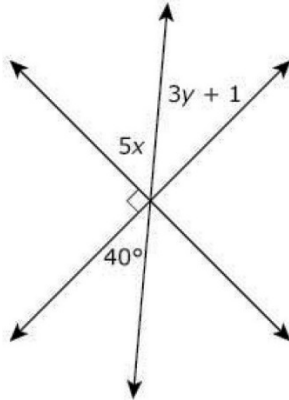$$-141 \qquad\qquad -141$$
$$3y = 39$$
$$\frac{3y}{3} = \frac{39}{3}$$
$$y = 13$$

Score Point 4B

This question has four parts.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.

3y + 1

5x

40°

Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

> The angle ajacant to the right of the $40°$ angle on the bottom is complimentory to it, therefore it equals $50°$ if that angle is vertical to the angle labled 5x, that angle is also $50°$ if you right out the equation
> $$5x = 50$$

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

> if $5x = 50$
> $$50 \div 5 = 10$$
> Therefor $x = 10$

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

> The angle labled $3y + 1$ is vertical to the angle labled $40°$ therefore they are equal. So,
> $$3y + 1 = 40$$

Part D

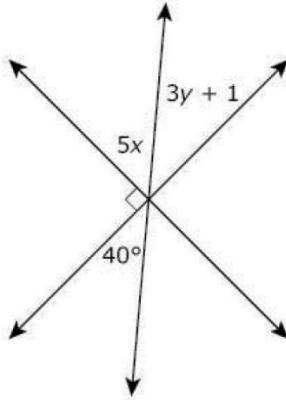Use your equation from Part C to determine the value of y. Show or explain how you got your answer.

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

> $$3y + 1 = 40$$
> $$40 - 1 = 39$$
> $$3y = 39$$
> $$39 \div 3 = 13$$
> $$y = 13$$

Score Point 3

This question has four parts.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.

Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

> $50 = 5x$
>
> First I found many other angle's degrees.
>
> I added together two vertical angle s, which were both 40 degrees, that gave me 80 degrees. I added the 2 90 degree angles, which gave me 260 degrees. Then, I subtracted 360 from 260 which gave me 100. This means that the two remaining vertical angles have to be 50 degrees.

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

> $50 = 5x$
>
> /5   /5
>
> $8 = x$

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

> $40 = 3y + 1$
>
> I know 3y + 1 and 40 are vertical angles, so they should have the same amount of degrees.

Part D

Use your equation from Part C to determine the value of y. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.
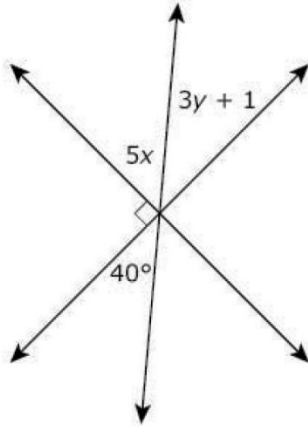
> $40 = 3y + 1$
>
> -1 -1
>
> 39 = 3y
>
> /3   /3
>
> $y = 13$

Score Point 2

This question has four parts.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.

Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

$$180 - (90 + 40) \div 5$$

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

$$90 + 40 = 130$$
$$180 - 130 = 50$$
$$\frac{50}{5} = 10$$
$$x = 10$$

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

$$(40 - 1) \div 3$$

Part D

Use your equation from Part C to determine the value of y. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.
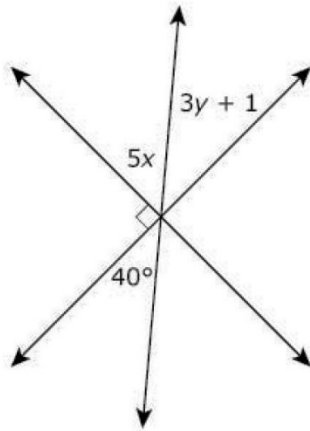
$$40 - 1 = 39$$
$$39 \div 3 = 13$$
$$y = 13$$

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Score Point 1

This question has four parts.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.

Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

> The value of x is 70.

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

> I got this by looking at the arrows across the 5x and guessed 70.

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

> The value of y is 13.

Part D

Use your equation from Part C to determine the value of y. Show or explain how you got your answer.
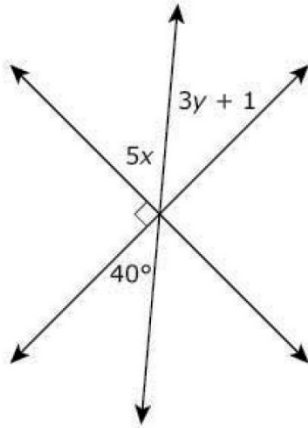
Enter your answer and your work or explanation in the space provided.

> I got the value of y from subtracting 1 from adding 1 then subtracting 1 from 40 getting 39 then did 39 divided by 3 and got 13.

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Score Point 0

This question has four parts.

Three lines intersect to form six angles. The measures, in degrees, of some of the angles are represented by expressions, as shown in this diagram.

Part A

Based on the diagram, write an algebraic equation that can be used to find the value of x. Show or explain how you got your answer.

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

$$40 + 3y + 1 + 5x \div 6$$

Part B

Use your equation from Part A to determine the value of x. Show or explain how you got your answer.

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

$$40 + 3y = 43y$$
$$43y + 1 = 44y$$
$$44y + 5x = 49x$$
$$49x \div 6 = 8.3$$

Part C

Based on the diagram, write an algebraic equation that can be used to find the value of y. Show or explain how you got your answer.

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

$$40 + 3y + 1 + 5x \div 6$$

Part D

Use your equation from Part C to determine the value of y. Show or explain how you got your answer.

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

$$40 + 3y + 1 + 5x \div 6 = 8.3y$$

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