2024 MCAS Sample Student Work and Scoring Guide

Grade 10 Mathematics
Question 34: Constructed-Response

Reporting Category: Algebra and Functions
Standards: AI.A-CED.A.3 - Represent constraints by linear equations or inequalities, and by systems of linear equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
MI.A-CED.A.3 - Represent constraints by linear equations or inequalities, and by systems of linear equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
Item Description: Create and solve a system of linear equations in two variables using given constraints, and create and analyze a related inequality.
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 Algebra concepts involved in representing constraints by equations or inequalities, and by systems of equations and/or inequalities. The student correctly writes and solves a system of equations and then writes and solves a system of inequalities based on given constraints.
4B	
3	The student response demonstrates a good understanding of the Algebra concepts involved in representing constraints by equations or inequalities, and by systems of equations and/or inequalities. 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 Algebra concepts involved in representing constraints by equations or inequalities, and by systems of equations and/or inequalities. 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 Algebra concepts involved in representing constraints by equations or inequalities, and by systems of equations and/or inequalities.
0	The student response contains insufficient evidence of an understanding of the Algebra concepts involved in representing constraints by equations or inequalities, and by systems of equations and/or inequalities. 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.

Part A

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

> $r + w = 2$ hours

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

> $6.5r + 4w = 9$ miles

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

> $6.5r + 4\left(2 - r\right) = 9$
>
> $6.5r + 8 - 4r = 9$
>
> $2.5r = 1$
>
> $r = .4$
>
> She is running for 24 minutes

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

$$r + w = 1.5$$

$$8r + 3w = 9$$

$$8r + 3\left(1.5 - r\right) = 9$$

$$5r + 4.5 = 9$$

$$5r = 4.5$$

$$r = .9$$

1.5 hours - .9 hours = .6 hours

He can walk no longer than 36 minutes to reach his goal.

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Score Point 4B

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

$r + w = 2$

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

$6.5r + 4w = 9$

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

Greta runs for $\frac{2}{5}$ hours while exercising.

I created a system of equations:

$6.5r + 4w = 9$

$(r + w = 2)(-4)$

This canceled the w terms and gave me the equation of $2.5r = 1$, which simplifies ro $r = \frac{2}{5}$. Therefore, Greta runs for $\frac{2}{5}$ of an hour.

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

Evan can walk for $\frac{3}{5}$ of an hour and still achieve his goal. Like before, I created a system:

$8r + 3w \geq 9$

$(r + w \leq 1.5) (-3)$

This gave me $5r \geq 4.5$ (the $\square \leq \square$ sign switches upon multiplication of a negative number), which simplifies to $r \geq \frac{9}{10}$. Since $r + w \leq \frac{15}{10}$, and r is at a minimum $\frac{9}{10}$, the maximum w can be is $\frac{6}{10}$ or $\frac{3}{5}$.

Score Point 3

This question has four parts.

Part A

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

$2 = r + w$

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

$9 = 6.5r + 4w$

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

Greta runs 0.4 hours or 24 minutes.

I multiplied $r + w = 2$ by 4 so I could cancel out the w variable, then I subtracted $6.5r + 4w = 9$ by what I got which comes down to $2.5r = 1$. Isolate r and get 0.4

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

Evan can walk for $\frac{1}{7}$ of an hour and still achieve his goal. Multiply the equation $1.5 = r + w$ by 8 so the r variable will cancel out. Then subtract the two equations which comes down to $3 = 21w$. Isolate w and get $\frac{1}{7}$

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Score Point 2

This question has four parts.

Part A

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

$2 = r + w$

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

$9 = 6.5r + 4w$

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

Greta runs for 1 hours while exercising, I got this by determining that she exercised for 2 hours and went 9 miles so I added up the 6.5 miles an hour and the 4 miles an hour to get my answer.

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

He can walk for 30 minutes and still achieve his goal, I got this by assuming he ran for an hour to get 8 miles then divided 3 by 2 for the half an hour and added the 1.5 miles to the 8.

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Score Point 1

This question has four parts.

Part A

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

$r + w = 2 hours$

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

$r + w = 10.5$ mph

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

Greta ran for 6 and a half hours because if she ran 6.5 miles per hour every half a mile was an hour.

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

The greatest amount of hours that Evan can walk is 3 hours because if Evan walk 3 miles per hour an he want to reach 9 miles per hour he nned 3 hours. $3 \times 3 = 9$

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Score Point 0

This question has four parts.

Part A

Greta exercises for a total of 2 hours each day. She runs for r hours and then walks for w hours.

Create an equation in terms of r and w that can be used to represent the amount of time, in hours, Greta exercises each day.

Enter your equation in the space provided.

$2 = rw$

Part B

Greta runs at a rate of 6.5 miles per hour and walks at a rate of 4 miles per hour. She covers a total distance of 9 miles while exercising.

Create an equation in terms of r and w that can be used to represent the total distance, in miles, Greta covers while exercising.

Enter your equation in the space provided.

$9m = 6.5 \frac{4}{x}$

Part C

Determine the number of hours Greta **runs** while exercising. Show or explain how you got your answer.

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

Greta runs for an hour and 26 minutes. The amount of miles she gains in 26 minutes is equal to 2.5 miles and plus the 6.5 per mile she already ran, it adds up to 9 miles.

Part D

Evan runs at a rate of 8 miles per hour and walks at a rate of 3 miles per hour. His goal is to cover 9 miles in no more than 1.5 hours.

What is the greatest number of hours that Evan can walk and still achieve his goal? Show or explain how you got your answer.

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

Evan can walk for 45 minutes and gain 2.125 miles and then run for the rest of it.

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