

# 2023 MCAS Sample Student Work and Scoring Guide

## Grade 10 Mathematics

### Question 34: Constructed-Response

**Reporting Category:** Number and Quantity

**Standards:** [AI.N-Q.A.1](#) - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

[MI.N-Q.A.1](#) - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

**Item Description:** Use dimensional analysis and translate between units to solve real-world problems, and then apply the solutions to a related problem.

**Calculator:** Allowed

[View item in MCAS Digital Item Library](#)

### Scoring Guide

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

Score*	Description
<a href="#">4A</a>	The student response demonstrates an exemplary understanding of the Number and Quantity concepts involved in using units as a way to understand problems and to guide the solution of multi-step problems. The student uses dimensional analysis and solves problems that require the manipulation of units.
<a href="#">4B</a>	
<a href="#">3</a>	The student response demonstrates a good understanding of the Number and Quantity concepts involved in using units as a way to understand problems and to guide the solution of multi-step problems. 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.
<a href="#">2</a>	The student response demonstrates a fair understanding of the Number and Quantity concepts involved in using units as a way to understand problems and to guide the solution of multi-step problems. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
<a href="#">1</a>	The student response demonstrates a minimal understanding of the Number and Quantity concepts involved in using units as a way to understand problems and to guide the solution of multi-step problems.
<a href="#">0</a>	The student response contains insufficient evidence of an understanding of the Number and Quantity concepts involved in using units as a way to understand problems and to guide the solution of multi-step problems. 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.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

It would take Ellis 12.8 minutes to run one mile. Since Ellis can run the whole track in 3.2 minutes, and the track is  $\frac{1}{4}$  of a mile, I multiplied  $3.2 \times 4$  to get 12.8 minutes.

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

Ellis can run 412.5 feet in one minute. Since Ellis can run a mile in 12.8 minutes, and one mile is equal too 5280 feet, I divided  $5280 \div 12.8$  and got 412.5 feet per minute.

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

Ellis runs the track at 4.6875 miles per hour. Since Ellis can run 1 mile in 12.8, I divided 60 minutes (one hour) by 12.8 minutes, the length of time it takes Ellis to run one mile. I then multiplied one mile by 4.6875 to get my answer.

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Yes, Ellis will surpass his goal and run 15.625 miles. Since Ellis runs one mile in 12.8 minutes, I divided 40 minutes by 12.8, to get 3.125, which is the number of miles Ellis will run each day. Since Ellis is going to run for 5 days, I multiplied 3.125 times 5 days, and got 15.625 miles.

[Back to Scoring Guide](#)

**Score Point 4B**

This question has four parts.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

it takes ellis 12.8 minutes to run a mile

$$\frac{4}{1} \times 3.2 = 12.8$$

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

$\frac{1}{4}$  of 5280 (Feet in a mile) is 1320

$$\frac{1320}{3.2} = 412.5 \text{ ft in a minute}$$

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

$$\frac{60}{12.8} = 4.6875 \text{ mph}$$

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

$$\frac{40}{12.8} \times 5 = 15.625$$

Yes she will reach her goal.

[Back to Scoring Guide](#)

**Score Point 3**

This question has four parts.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

$$\frac{1}{4} = 3.2$$

$$1 = 12.8 \text{ minutes}$$

Multiply the time for one lap by 4 because it takes 4 full laps to equal a mile.

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

1650 feet is how much Ellie ran in one minute.

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

It takes Ellie 12.8 minutes to run one mile, there are 60 minutes per hour.

$$\frac{60}{12.8} = 4.7mph$$

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Yes Ellis will meet her goal.

40 minutes per day and it takes her 12.8 minutes to run 1 mile.

$$\frac{40}{12.8} = 3.125 \text{ miles per day}$$

Multiply that by 5.  $3.125 \times 5 = 15.625$

[Back to Scoring Guide](#)

**Score Point 2**

This question has four parts.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

It takes here 12.8 minutes to run a full mile, because  $3.2 \times 4$  is 12.8.

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

412.5 feet because she can run 1320 feet ( a quater mile ) in 3.2 mins, and  $1320 \div 3.2$  is 412.5.

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

She is going 18.75 miles per hour. This is because there is 60 minutes in an hour, and 60 divided by 3.2 minutes is 18.75.

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

No, Ellis will not meet her goal. This is because it takes her 3.2 minutes to just run a quater of a mile, so it would take her 12.8 minutes to run a full mile. Theres no way she can do 12.8 minutes 15 times in 5 days, with 40 minute increments.



**Score Point 1**

This question has four parts.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

12.8 minutes because she did 3.2 minutes  $\frac{1}{4}$  but she needs  $\frac{3}{4}$  more of the way so I did 3.2 times 4 which is 12.8

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

1320 feet because 1 mile in feet is 5,280 feet and 5,280 divided by 4 is 1,320

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

About 10 mph if she runs  $\frac{1}{4}$  of a mile in 3.2 minutes.

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

No she will be at 48 minutes to complete 15 miles not 40

**Score Point 0**

This question has four parts.

Ellis runs around a track at a constant speed.

- The distance around the track is  $\frac{1}{4}$  mile.
- It takes Ellis 3.2 minutes to run around the track once.

**Part A**

What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

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

It would take Ellis 2.2 minutes to run 1 mile.

$$3.2 - 1 = 2.2$$

**Part B**

What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

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

Ellis would run 0.25ft in 1 minute.  $\frac{1}{4} \cdot 2.2$

$$\frac{2.2}{8.8} = 0.25$$

**Part C**

What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

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

10.24mph

$$3.2 \cdot 3.2 = 10.24$$

**Part D**

Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Ellis will meet her goal because  $40 \cdot 5 = 200 - 15 = 195$