2026 MCAS Sample Student Work and Scoring Guide

Grade 10 Mathematics
Question 13: Constructed-Response

Reporting Category: Number and Quantity
Standard: N-RN.B.3 - Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Item Description: Identify irrational numbers from a list, determine whether a sum and a product of numbers from the list are rational, and assess a claim about operations with rational numbers.

Calculator: Not 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 Number and Quantity concepts involved in explaining why the sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational. The student correctly uses properties of given rational and irrational numbers to determine the nature of their sums and products.
3	The student response demonstrates a good understanding of the Number and Quantity concepts involved in explaining why the sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational. 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 Number and Quantity concepts involved in explaining why the sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational. 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 Number and Quantity concepts involved in explaining why the sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational.
0	The student response contains insufficient evidence of an understanding of the Number and Quantity concepts involved in explaining why the sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational. 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).

Question Introduction

This question has four parts.

Consider this list of numbers.

$$-5,\ \frac{1}{2},\ 1.8,\ 2\sqrt{2},\ 6,\ \sqrt{10}$$

Score Point 4A

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

A -5

B $\frac{1}{2}$

C 1.8

D $2\sqrt{2}$

E 6

F $\sqrt{10}$

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Two rational numbers from the list are 1.8 and 6. Their sum is 7.8, which is rational. This is because adding 2 rational numbers gives a rational number as a whole because they are from the same set of numbers. The sum is 7.8 because adding 6 and 1.8 can boil down to adding 6 and 1 and then adding 0.8 to the solution. This gives 7+0.8, which is 7.8.

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

The value is irrational because the irrationality of a number can not be taken away by multiplying it by a rational number. Instead, the product is irrational. The result is $-10\sqrt{2}$.

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

The student's claim is not true because a rational number cannot become irrational using the 4 elementary operations unless an irrational number is introduced, which if the product is between 2 rational numbers, it is not. This means that the product will always be rational.

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Score Point 4B

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

A -5

B $\frac{1}{2}$

C 1.8

D $2\sqrt{2}$

E 6

F $\sqrt{10}$

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

$-5 + \frac{1}{2} = -4.5$

The sum is rational. The sum of two rational numbers will always be rational as well, as there can be no irrationality added. Here, -4.5 can be expressed as a fraction $-\frac{9}{2}$ so it is rational.

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

$(-5)(2\sqrt{2}) = -10\sqrt{2}$

The value of the expression is irrational, because it cannot be expressed as a fraction.

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

The student's claim is false. Given two rational numbers, their product will always be rational. There is no irrationality in either of the rational numbers, so their product can't be it either.

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Score Point 3

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

A -5	B $\frac{1}{2}$
C 1.8	D $2\sqrt{2}$
E 6	F $\sqrt{10}$

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

-5 and 6 are rational numbers. Their sum is -5 + 6 = 1. The number 1 is rational.

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

This expression is irrational. This is becuase 2 and the square root of 2 is irrational so when multiplying them together the whole expression the turns irrational.

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

No the students claim is not true. When you multiply two rational numbers together their products will always be rational.

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Score Point 2

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

A -5 B $\frac{1}{2}$

C 1.8 D $2\sqrt{2}$

E 6 F $\sqrt{10}$

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

1.8 and 1/2 are both rational, the sum of both numbers is 23/10 or 1 and 3/10ths. this number is still a rational because it has a ratio in it (23/10 or 3/10).

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

the value when i calculated it was -10 $\sqrt{2}$ and that is still irrational since it has a square root that cant be broken down.

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

i agree with the student, product is multiplication and when you mutiply rational numbers together I cannot think of two rational numbers that could multiply and create an irrational.

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Score Point 1

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

- [A] -5
- [B] $\frac{1}{2}$
- [C] 1.8
- [D] $2\sqrt{2}$ ✓
- [E] 6
- [F] $\sqrt{10}$ ✓

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

they are irrational becase they are inequalities

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

This value is rational

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

yes the students claim is true

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Score Point 0

Part A

Which numbers from the list are irrational?

Select the **two** correct answers.

- A -5
- B $\frac{1}{2}$
- C 1.8
- D $2\sqrt{2}$
- E 6
- F $\sqrt{10}$

Part B

Identify two **rational** numbers from the list **and** find their sum. Is the sum rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

the sum of 1/2 is .5 and the sum of $2\sqrt{2}$ is 4. .5 isnt and 4 is.

Part C

Consider this expression, which represents the product of two numbers from the list.

$$(-5)(2\sqrt{2})$$

Is the value of the expression rational or irrational? Explain your reasoning.

Enter your answer and your explanation in the space provided.

rational it will equal a whole number

Part D

A student claims that the product of any two **rational** numbers is **not** always rational. Is the student's claim true? Explain your reasoning.

Enter your answer and your explanation in the space provided.

yes because it could be less than 1

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