2025 MCAS Sample Student Work and Scoring Guide

Grade 10 Mathematics
Question 13: Constructed-Response

Reporting Category: Number and Quantity
Standard: N-RN.A.1 - Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
Item Description: Evaluate expressions involving radicals and rational exponents, rewrite an exponential expression as a radical expression, and determine the value of the variable in a radical expression that gives the expression a known value.
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	The student response demonstrates an exemplary understanding of the Number and Quantity concepts involved in explaining how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. The student correctly evaluates rational exponential expressions and rewrites other exponential expressions using radicals.
4B	
3	The student response demonstrates a good understanding of the Number and Quantity concepts involved in explaining how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. 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 how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. 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 how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
0	The student response contains insufficient evidence of an understanding of the Number and Quantity concepts involved in explaining how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. 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.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$\left(\sqrt{16}\right)^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

$$\sqrt{16} = 16^{\frac{1}{2}}$$

$$\left(\sqrt{16}\right)^2 = 16^{\frac{1}{2} \times 2}$$

$$\left(\sqrt{16}\right)^2 = 16^1 = 16$$

Part B

Edith writes this exponential expression.

$$\left(25^{\frac{1}{2}}\right)^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

$$\left(25^{\frac{1}{2}}\right)^2 = 25^{\frac{1}{2} \times 2}$$

$$25^1 = 25$$

Part C

Walter writes this exponential expression.

$$\left(n^{\frac{1}{4}}\right)^3$$

Which of the following radical expressions is equivalent to Walter's expression?

○ A. $\sqrt[3]{n^4}$ ◉ B. $\sqrt[4]{n^3}$

○ C. $\sqrt[4]{n^{13}}$ ○ D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$\left(\sqrt[3]{x}\right)^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

$$\left(\sqrt[3]{x}\right)^2 = 4$$

$$\sqrt[3]{x} = a$$

$$a^2 = 4$$

$$a = 2, a = -2$$

$$\sqrt[3]{x} = 2$$

$$x = 8$$

$$\sqrt[3]{x} = -2$$

$$x = -8$$

$$x = 8, x = -8$$

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Score Point 4B

This question has four parts.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$(\sqrt{16})^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

> It would be 16. Similar to how multiplication and division cancel each other out, square root and squaring do the same. If he were to solve it out, he would get $\sqrt{16}^2 = 4^2 = 16$

Part B

Edith writes this exponential expression.

$$(25^{\frac{1}{2}})^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

> Edith would get 25. Having an exponent below one can be rewritten as a root of some kind. In this case, it would be $\sqrt{25}$. Squaring a square root of a number would just bring us back to the original number.

Part C

Walter writes this exponential expression.

$$(n^{\frac{1}{4}})^3$$

Which of the following radical expressions is equivalent to Walter's expression?

○ A. $\sqrt[3]{n^4}$ ◉ B. $\sqrt[4]{n^3}$

○ C. $\sqrt[4]{n^{13}}$ ○ D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$(\sqrt[3]{x})^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

> x would be 8. First, I created an equation. $\sqrt[3]{x}^2 = 4$. I then took the cube root and square and applied it to the 4. $\sqrt[3]{x} = \sqrt{4} = 2; x = 2^3 = 8$

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Score Point 3

This question has four parts.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$\left(\sqrt{16}\right)^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

> The value is 16, because the squaring of a square root term cancels out and leaves the 16.

Part B

Edith writes this exponential expression.

$$\left(25^{\frac{1}{2}}\right)^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

> $25^{.5}$ is equal to 12.5, so i squared 12.5 to get 156.25

Part C

Walter writes this exponential expression.

$$\left(n^{\frac{1}{4}}\right)^3$$

Which of the following radical expressions is equivalent to Walter's expression?

○ A. $\sqrt[3]{n^4}$ ◉ B. $\sqrt[4]{n^3}$

○ C. $\sqrt[4]{n^{13}}$ ○ D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$\left(\sqrt[3]{x}\right)^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

> I canceled out the square, which left $\sqrt[3]{x} = 2$. Then I cubed 2, which left me with the answer of 8.

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Score Point 2

This question has four parts.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$\left(\sqrt{16}\right)^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

> The square root of 16 is 4 and you would do that first because its in parenthesis and then you would square 4 to get 16 again.

Part B

Edith writes this exponential expression.

$$\left(25^{\frac{1}{2}}\right)^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

> I started by multiplying the exponents first and got $\left(25^{\frac{2}{2}}\right)$ which is just 25 to the first power so the answer would just be 25.

Part C

Walter writes this exponential expression.

$$\left(n^{\frac{1}{4}}\right)^3$$

Which of the following radical expressions is equivalent to Walter's expression?

◉   A. $\sqrt[3]{n^4}$ ○   B. $\sqrt[4]{n^3}$

○   C. $\sqrt[4]{n^{13}}$ ○   D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$\left(\sqrt[3]{x}\right)^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

> $x = 2$ because it is the only number that when squared will equal 4.

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Score Point 1

This question has four parts.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$\left(\sqrt{16}\right)^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

> i did the square root of 16 and i got 2 then i did 2 squared is 4

Part B

Edith writes this exponential expression.

$$\left(25^{\frac{1}{2}}\right)^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

> 125,000

Part C

Walter writes this exponential expression.

$$\left(n^{\frac{1}{4}}\right)^3$$

Which of the following radical expressions is equivalent to Walter's expression?

- ○ A. $\sqrt[3]{n^4}$
- ● B. $\sqrt[4]{n^3}$
- ○ C. $\sqrt[4]{n^{13}}$
- ○ D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$\left(\sqrt[3]{x}\right)^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

> 2

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Score Point 0

This question has four parts.

Four students are studying expressions.

Part A

Lionel writes this radical expression.

$$(\sqrt{16})^2$$

What is the value of Lionel's expression? Show or explain how you got your answer.

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

> i did 16 multiplyed by 16, the answet is 16 squared which means
> 16 squared is 256

Part B

Edith writes this exponential expression.

$$(25^{\frac{1}{2}})^2$$

What is the value of Edith's expression? Show or explain how you got your answer.

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

> i did $\frac{1}{2}$ of 25 x 12.5 and got 312.5

Part C

Walter writes this exponential expression.

$$(n^{\frac{1}{4}})^3$$

Which of the following radical expressions is equivalent to Walter's expression?

  ⦿ A. $\sqrt[3]{n^4}$ ◯ B. $\sqrt[4]{n^3}$

  ◯ C. $\sqrt[4]{n^{13}}$ ◯ D. $\sqrt[13]{n^4}$

Part D

Gloria writes this radical expression.

$$(\sqrt[3]{x})^2$$

Gloria's expression is equivalent to 4. What is the value of x in the expression? Show or explain how you got your answer.

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

> i did 4 x 3 ÷ 2 and got 6

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