

2026 MCAS Sample Student Work and Scoring Guide

Grade 8 Mathematics

Question 4: Constructed-Response

Reporting Category: Number System & Expressions and Equations

Standard: [8.EE.A.1](#) - Know and apply the properties of integer exponents to generate equivalent numerical expressions.

Item Description: Apply properties of integer exponents to generate equivalent expressions.

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 Expressions and Equations concepts involved in knowing and applying the properties of integer exponents to generate equivalent numerical expressions. The student correctly multiplies and divides expressions with exponents.
3	The student response demonstrates a good understanding of the Expressions and Equations concepts involved in knowing and applying the properties of integer exponents to generate equivalent numerical expressions. 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 Expressions and Equations concepts involved in knowing and applying the properties of integer exponents to generate equivalent numerical expressions. 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 Expressions and Equations concepts involved in knowing and applying the properties of integer exponents to generate equivalent numerical expressions.
0	The student response contains insufficient evidence of an understanding of the Expressions and Equations concepts involved in knowing and applying the properties of integer exponents to generate equivalent numerical expressions. 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.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression.

$$2^3 \cdot 2^2$$

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

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

$$2^5$$

When exponents of the same base are multiplied, the exponent adds and the base stays the same.

Part B

Next, Rachel wrote this expression.

$$\frac{4^3}{4^1}$$

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

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

$$4^2$$

When exponents of the same base are divided, the exponent subtracts and the base stays the same.

Part C

Then, Rachel wrote this equation.

$$\frac{4^{12}}{4^x} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

$$x = 7$$

$$12 - 7 = 5$$

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table.

Expression S	$4^{-2} \cdot 4^7$
Expression T	$\frac{4^6}{4^3}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 + 2 = 6 + 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Rachel is incorrect. Expression S would be $7 - 2 = 5$ instead of $7 + 2 = 9$ and expression T would be $6 - 3 = 3$ instead of $6 + 3 = 9$.

Score Point 4B

This question has four parts.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression:

$$2^1 \cdot 2^4$$

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

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

$$2^1 \cdot 2^4$$

$$2 \cdot 16$$

$$32$$

Part B

Next, Rachel wrote this expression:

$$\frac{4^5}{4^2}$$

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

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

$$\frac{4^5}{4^2}$$

First you put the number into expanded form

$$\frac{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}{4 \cdot 4 \cdot 4}$$

Then you cancel some of the numbers out

$$\frac{4 \cdot 4}{1}$$

than you complete it.

$$16$$

Part C

Then, Rachel wrote this equation:

$$\frac{4^{12}}{4^5} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

x would have to equal 7

this is so some of the numbers from 4^{12} would cancel out

$$\frac{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}$$

$$\frac{4^5}{1} = 4^5$$

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table:

Expression S	$8 \cdot 2 \cdot 4^2$
Expression T	$\frac{4^6}{4^3}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 + 2 = 8 + 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Rachel is incorrect. The answer to expression s would be 4^5 , while the answer to expression t would be 4^3

Score Point 3

This question has four parts.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression.

$$2^1 \cdot 2^4$$

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

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

$2^1 \times 2^4$ equals 2^5 because 1 plus 4 equals 5.

Part B

Next, Rachel wrote this expression.

$$\frac{4^5}{4^3}$$

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

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

the value is 4^2 because 5 minus 3 equals 2.

Part C

Then, Rachel wrote this equation.

$$\frac{4^{12}}{4^x} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

4^7 , because 12 minus 7 is 5

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table.

Expression S	$4^{-2} \cdot 4^7$
Expression T	$\frac{4^6}{4^3}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 + 2 = 6 + 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

Rachel is not correct because its minus 2

Score Point 2

This question has four parts.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression:

$$2^1 \cdot 2^4$$

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

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

$$2^1 = 2 \quad 2^4 = 16$$

$$16 \cdot 2 = 32$$

Part B

Next, Rachel wrote this expression:

$$\frac{4^5}{4^3}$$

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

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

$$4^5 = 1024$$

$$4^3 = 64$$

$$\frac{1024}{64} = 16$$

Part C

Then, Rachel wrote this equation:

$$\frac{4^{12}}{4^5} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

$$4^{12} = 6,777,206$$

$$4^5 = 1024$$

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table.

Expression S	$4^{-2} \cdot 4^7$
Expression T	$\frac{4^6}{4^1}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 + 2 = 6 + 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

yes, the exponents can be added and subtracted

Score Point 1

This question has four parts.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression:

$$2^1 \cdot 2^4$$

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

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

32

Part B

Next, Rachel wrote this expression:

$$\frac{4^3}{4^2}$$

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

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

45

Part C

Then, Rachel wrote this equation:

$$\frac{4^{12}}{4^7} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

yes

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table.

Expression S	$4^{-2} \cdot 4^7$
Expression T	$\frac{4^6}{4^3}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 - 2 = 6 - 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

yes

Score Point 0

This question has four parts.

Rachel wrote several expressions and equations using exponents.

Part A

First, Rachel wrote this expression.

$$2^1 + 2^4$$

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

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

$$2^1 = 2 \text{ and } 2^4 = 8 \text{ so } 2 + 8 = 10$$

Rachels first expression equals 10

Part B

Next, Rachel wrote this expression.

$$\frac{4^5}{4^3}$$

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

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

$$\frac{20}{12} = 2\frac{1}{6}$$

The asnwer of her secound expression is $2\frac{1}{6}$

Part C

Then, Rachel wrote this equation.

$$\frac{4^{12}}{4^x} = 4^5$$

What value of x will make Rachel's equation true? Show or explain how you got your answer.

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

$$4^{12} = 48 \text{ so } \frac{48}{4^x} = 20$$

$$\frac{48}{960} = 20$$

Part D

Finally, Rachel compared the values of two expressions. Both expressions are shown in this table.

Expression S	$4^{-12} + 4^7$
Expression T	$\frac{4^6}{4^7}$

Rachel claims that expression S and expression T in the table are equivalent expressions because $7 + 2 - 6 = 3$.

Is Rachel's claim correct? Explain your reasoning.

Enter your answer and your explanation in the space provided.

No because you cant add what you squaresing a number by you only can add the whole numbers you get after squaring the number