

Module 4: Radical Expressions

Topic 1 Content: Simplifying Cube Roots of Integers

Introduction



Today's Lesson

- You will apply the Product Property of Radicals to simplify cube roots of integers.
- You will use your factoring skills.

Hi there! I'm so glad you could join me for this lesson in Algebra I. In this lesson, you will apply the Product Property of Radicals to simplify cube roots of integers. Your factoring skills will prove useful during this lesson.

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Simplifying Cube Roots of Integers

SIMPLIFYING CUBE ROOTS OF INTEGERS

Click the Examples Below to Learn More

Example One

Example Three

Example Two

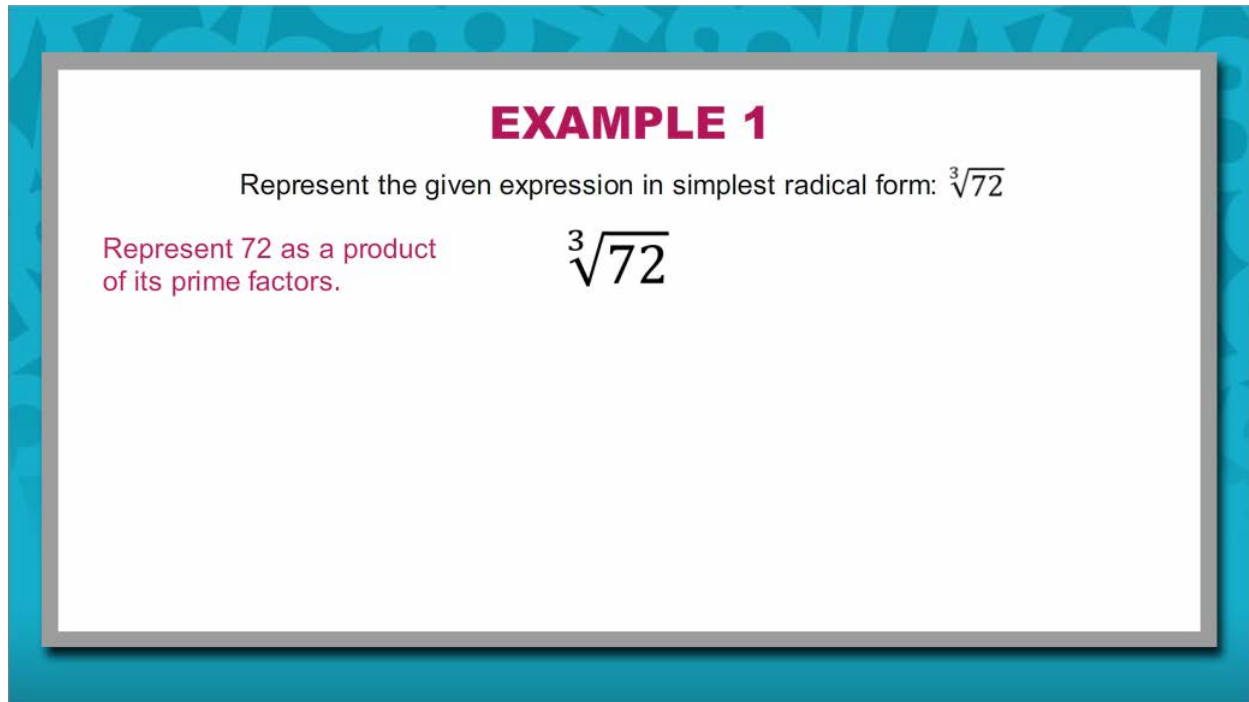
Self-Check

Click the examples below to learn more.

- Example One
- Example Two
- Example Three
- Self-Check

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Example 1



EXAMPLE 1

Represent the given expression in simplest radical form: $\sqrt[3]{72}$

Represent 72 as a product of its prime factors.

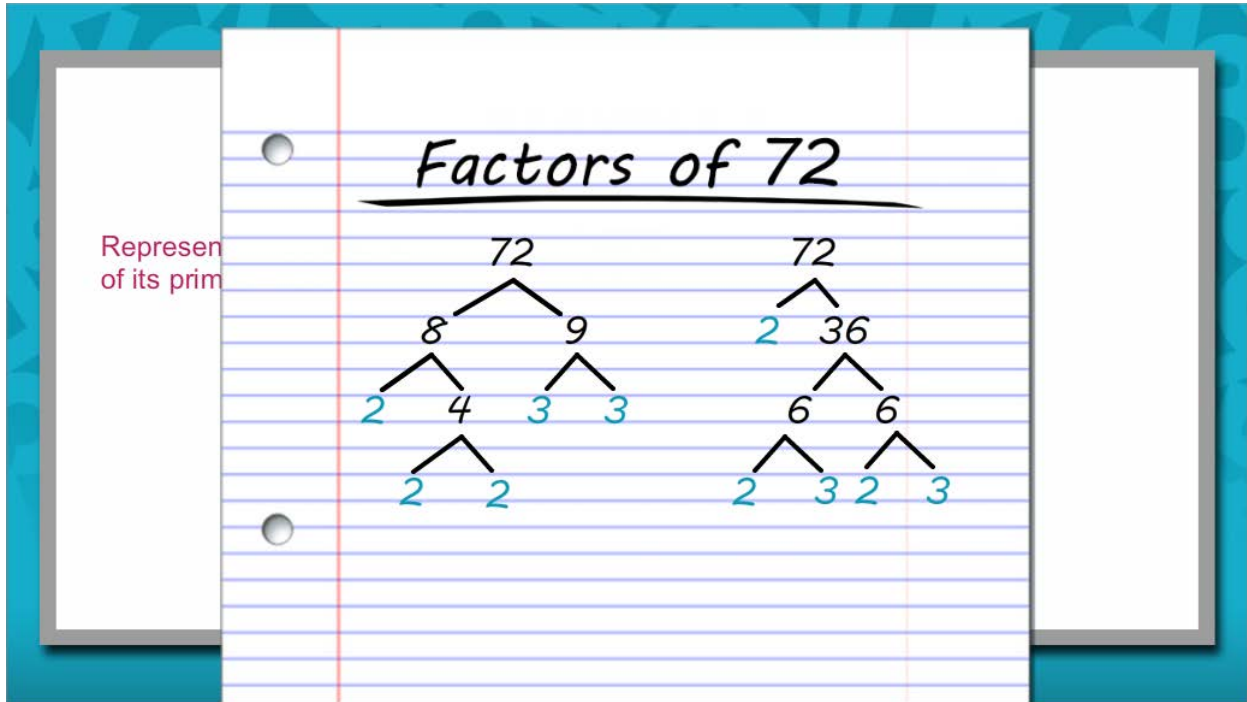
$$\sqrt[3]{72}$$

Represent the given expression in simplest radical form: $\sqrt[3]{72}$

A cube root expression is in simplest form when the radicand has no perfect cube factors other than one. To represent $\sqrt[3]{72}$ in simplest radical form, start by completing the prime factorization of 72. You may find it helpful to use a factor tree.

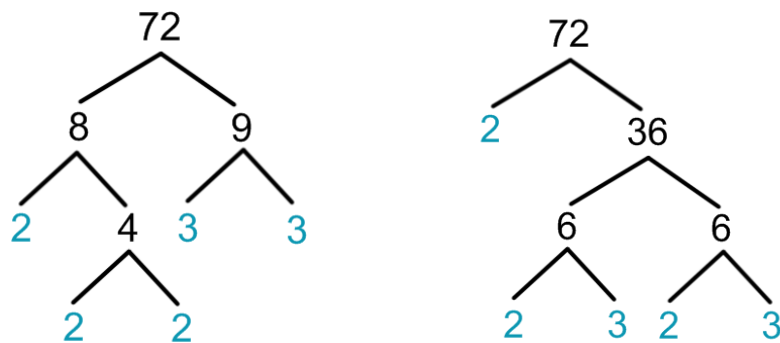
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Example 1 (continued)



The branches of your factor tree will depend on the initial factors of 72 that you choose to begin with. The prime factors, however, will be the same.

Two possible factor trees of 72:



The prime factorization of 72 is $2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$.

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Example 1 (continued)

EXAMPLE 1

Represent the given expression in simplest radical form: $\sqrt[3]{72}$

<p>Represent 72 as a product of its prime factors.</p> <p>Identify multiple factors.</p> <p>Apply the Product Property of Radicals.</p>	$\begin{aligned}\sqrt[3]{72} &= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} \\ &= \sqrt[3]{2^3 \cdot 3 \cdot 3} \\ &= \sqrt[3]{2^3} \cdot \sqrt[3]{3 \cdot 3}\end{aligned}$
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The Product Property of Radicals states that the cube root of a product can be represented as the product of the cube roots of the factors.

Now that you know the prime factorization of 72, you can represent $\sqrt[3]{72}$ as $\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$.

$$\sqrt[3]{72} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$$

The next step is to identify any multiple factors. Because you are simplifying a cube root expression, the goal is to identify multiple factors that can be rewritten as a cube. $2 \cdot 2 \cdot 2$ can be represented as 2^3 .

$$= \sqrt[3]{2^3 \cdot 3 \cdot 3}$$

You can apply the Product Property of Radicals to represent the cube root of a product as the product of the cube roots of the factors. So $\sqrt[3]{72}$ can be represented as $\sqrt[3]{2^3} \cdot \sqrt[3]{3 \cdot 3}$.

$$= \sqrt[3]{2^3} \cdot \sqrt[3]{3 \cdot 3}$$

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Example 1 (continued)

EXAMPLE 1

Represent the given expression in simplest radical form: $\sqrt[3]{72}$

<p>Represent 72 as a product of its prime factors.</p> <p>Identify multiple factors.</p> <p>Apply the Product Property of Radicals.</p> <p>Simplify the expression.</p>	$\begin{aligned}\sqrt[3]{72} &= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} \\ &= \sqrt[3]{2^3 \cdot 3 \cdot 3} \\ &= \sqrt[3]{2^3} \cdot \sqrt[3]{3 \cdot 3} \\ &\quad \cdot \sqrt[3]{9} \\ &= \boxed{2\sqrt[3]{9}}\end{aligned}$
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Now simplify the expression. Begin with the first cube root factor. Recall that cubing a number and finding the cube root of a number are inverse operations. This means that $\sqrt[3]{2^3} = 2$.

Next simplify the radicand of the second cube root factor by multiplying 3 and 3; $3 \cdot 3 = 9$.

$$= 2 \cdot \sqrt[3]{9}$$

The final step is to simplify the resulting expression. Your work is complete. The simplest radical form of $\sqrt[3]{72}$ is $2\sqrt[3]{9}$.

$$= 2\sqrt[3]{9}$$

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Example 2

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$\sqrt[3]{405} = \sqrt[3]{\square \cdot \square \cdot \square \cdot \square \cdot \square}$

Enter the prime factors into the expression above, then click **SUBMIT**.
You may need to use a sheet of paper to create a factor tree.

Submit

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

To simplify the expression, begin by representing the radicand as a product of its prime factors.

$$\sqrt[3]{405} = \sqrt[3]{? \cdot ? \cdot ? \cdot ? \cdot ?}$$

Enter the prime factors into the expression above, then click **SUBMIT**. You may need to use a sheet of paper to create a factor tree.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\sqrt[3]{405} = \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5}$$

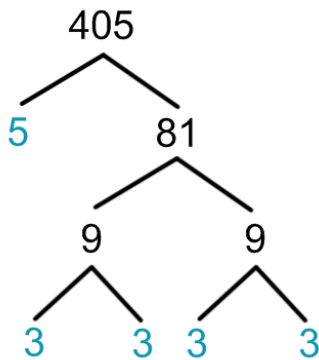
You can create a factor tree to complete the prime factorization of 405.

Click the button below to view an example of a factor tree created where the initial factors of 405 were 5 and 81.

The prime factorization of 405 is $3 \cdot 3 \cdot 3 \cdot 3 \cdot 5$.

$$\sqrt[3]{405} = \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5}$$

You can create a factor tree to complete the prime factorization of 405. Take a look at the example of a factor tree created when the initial factors of 405 were 5 and 81.



The prime factorization of 405 is $3 \cdot 3 \cdot 3 \cdot 3 \cdot 5$.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\sqrt[3]{405} = \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5}$$
$$= ?$$

Choose the appropriate expression below.

$\sqrt[3]{3^4 \cdot 3 \cdot 5}$

$\sqrt[3]{3^3 \cdot 3 \cdot 5}$

$\sqrt[3]{3^2 \cdot 3 \cdot 5}$

Now identify multiple factors that can be rewritten as a cube.

$$\sqrt[3]{405} = \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} = ?$$

Choose the appropriate expression below.

- A) $\sqrt[3]{3^4 \cdot 3 \cdot 5}$
- B) $\sqrt[3]{3^3 \cdot 3 \cdot 5}$
- C) $\sqrt[3]{3^2 \cdot 3 \cdot 5}$

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5}\end{aligned}$$

The correct answer is...

$\sqrt[3]{3^3 \cdot 3 \cdot 5}$

Next

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5}\end{aligned}$$

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5}\end{aligned}$$

$$\sqrt[3]{3^3 \cdot 3 \cdot 5} = \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5}$$

Is the statement above true or false?

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5}\end{aligned}$$

Next apply the Product Property of Radicals to represent the cube root of the product as the product of the cube roots of the factors.

$$\sqrt[3]{3^3 \cdot 3 \cdot 5} = \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5}$$

Is the expression above true or false?

- A) True
- B) False

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5}\end{aligned}$$

The statement is true. The cube root of a product equals the product of the cube roots of the factors.

True

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5}\end{aligned}$$

The expression is true. The cube root of the product equals the product of the cube roots of the factors.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= \square\end{aligned}$$

$\sqrt[3]{3^3}$ simplifies to...

Type your answer in the blank space and click **SUBMIT**.

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &=?\end{aligned}$$

Now simplify the expression.

$\sqrt[3]{3^3}$ simplifies to ...

Type your answer in the blank space and click **SUBMIT**.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3\end{aligned}$$

Cubing a number and finding the cube root of a number are inverse operations. Therefore, $\sqrt[3]{3^3} = 3$.

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3\end{aligned}$$

Cubing a number and finding the cube root of a number are inverse operations. Therefore, $\sqrt[3]{3^3} = 3$.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{\square}\end{aligned}$$

$\sqrt[3]{3 \cdot 5}$ simplifies to...

Type your answer in the blank space and click **SUBMIT**.

SUBMIT

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{?}\end{aligned}$$

$\sqrt[3]{3 \cdot 5}$ simplifies to....

Type your answer in the blank space and click **SUBMIT**.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{15}\end{aligned}$$

The product of 3 and 5 is 15.
Therefore, $\sqrt[3]{3 \cdot 5}$ simplifies to $\sqrt[3]{15}$.

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{15}\end{aligned}$$

The product of 3 and 5 is 15. Therefore, $\sqrt[3]{3 \cdot 5}$ simplifies to $\sqrt[3]{15}$.

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{15}\end{aligned}$$

In simplest radical form $\sqrt[3]{405}$ is equivalent to...

$15\sqrt[3]{3}$ $3\sqrt[3]{15}$ 45

Therefore, in simplest radical form $\sqrt[3]{405}$ is equivalent to...

- A) $15\sqrt[3]{3}$
- B) $3\sqrt[3]{15}$
- C) 45

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Example 2 (continued)

EXAMPLE 2

Represent the given expression in simplest radical form: $\sqrt[3]{405}$

$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{15} \\ &= \boxed{3\sqrt[3]{15}}\end{aligned}$	<p>Complete the prime factorization of 405.</p> <p>Represent multiple factors as cubes.</p> <p>Apply the Product Property of Radicals.</p> <p>Find the product of factors of the radicand.</p> <p>Simplify the expression.</p>
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$$\begin{aligned}\sqrt[3]{405} &= \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3 \cdot 3 \cdot 5} \\ &= \sqrt[3]{3^3} \cdot \sqrt[3]{3 \cdot 5} \\ &= 3 \cdot \sqrt[3]{15} \\ &= 3\sqrt[3]{15}\end{aligned}$$

Complete the prime factorization of 405.
Represent multiple factors as cubes.
Apply the Product Property of Radicals
Find the product of the factors of the radicand.
Simplify the expression.

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Example 3

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\sqrt[3]{-88} = \sqrt[3]{-1} \cdot \sqrt[3]{88}$$

Enter the prime factors into the expression below, then click **SUBMIT**.
You may need to use a sheet of paper to create a factor tree.

$$\sqrt[3]{88} = \sqrt[3]{\square \cdot \square \cdot \square \cdot \square}$$

Submit

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

When simplifying the cube root of a negative number, you can be certain that one of the factors of the radicand is -1 . So in the given expression, start by representing $\sqrt[3]{-88}$ as the product of $\sqrt[3]{-1}$ and $\sqrt[3]{88}$.

Next, begin to simplify $\sqrt[3]{88}$ by representing the radicand as the product of its prime factors.

$$\sqrt[3]{88} = \sqrt[3]{? \cdot ? \cdot ? \cdot ?}$$

Enter the prime factors into the expression above, then click **SUBMIT**. You may need to use a sheet of paper to create a factor tree.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\sqrt[3]{-88} = \sqrt[3]{-1} \cdot \sqrt[3]{88}$$

You can create a factor tree to complete the prime factorization of 88.

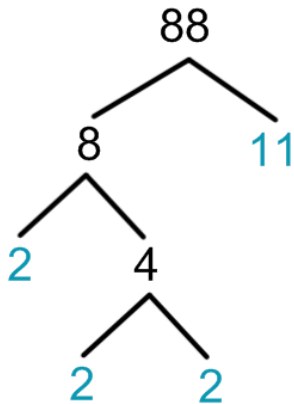
Click the button below to view an example of a factor tree created where the initial factors of 88 were 8 and 11.

The prime factorization of 88 is $2 \cdot 2 \cdot 2 \cdot 11$

$$\sqrt[3]{88} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11}$$

$$\sqrt[3]{88} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11}$$

You can create a factor tree to complete the prime factorization of 88. Take a look at the example of a factor tree created when the initial factors of 88 were 8 and 11.



The prime factorization of 88 is $2 \cdot 2 \cdot 2 \cdot 11$.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot ?\end{aligned}$$

Choose the appropriate expression.

$\sqrt[3]{2^3 \cdot 11}$

$\sqrt[3]{8^3 \cdot 11}$

$\sqrt[3]{2 \cdot 11^3}$

Now identify multiple factors that can be rewritten as a cube.

$$\sqrt[3]{88} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} = ?$$

Choose the appropriate expression.

- A) $\sqrt[3]{2 \cdot 11^3}$
- B) $\sqrt[3]{8^3 \cdot 11}$
- C) $\sqrt[3]{2^3 \cdot 11}$

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11}\end{aligned}$$

Three factors of 2 can be represented as a cube.

$\sqrt[3]{2^3 \cdot 11}$

Next

$$\begin{aligned}\sqrt[3]{88} &= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{2^3 \cdot 11}\end{aligned}$$

Three factors of 2 can be represented as a cube.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11}\end{aligned}$$

$\sqrt[3]{2^3 \cdot 11} = \sqrt[3]{2^3} \cdot \sqrt[3]{11}$

Is the statement above true or false?

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11}\end{aligned}$$

Next apply the Product Property of Radicals to represent the cube root of the product as the product of the cube roots of the factors.

$$\sqrt[3]{2^3 \cdot 11} = \sqrt[3]{2^3} \cdot \sqrt[3]{11}$$

Is the expression above true or false?

- A) True
- B) False

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}\end{aligned}$$

The statement is true. The cube root of a product equals product of the cube roots of the factors.

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}\end{aligned}$$

The expression is true. The cube root of a product is equal to the product of the cube roots of the factors

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}$$
$$= \text{[]}$$

$\sqrt[3]{-1}$ simplifies to...

Type your answer in the blank space and click **SUBMIT**.

SUBMIT

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &=?\end{aligned}$$

Now simplify the expression.

$\sqrt[3]{-1}$ simplifies to ...

Type your answer in the blank space and click **SUBMIT**.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned} &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \end{aligned}$$

Recall that -1 is a perfect cube. Therefore, $\sqrt[3]{-1} = -1$.

Next

$$\begin{aligned} \sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \end{aligned}$$

Recall that -1 is a perfect cube. Therefore, $\sqrt[3]{-1} = -1$.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}$$
$$= -1 \cdot \square$$

$\sqrt[3]{2^3}$ simplifies to...

Type your answer in the blank space and click **SUBMIT**.

SUBMIT

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot ?\end{aligned}$$

$\sqrt[3]{2^3}$ simplifies to ...

Type your answer in the blank space and click **SUBMIT**.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned} &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \end{aligned}$$

Cubing a number and finding the cube root of a number are inverse operations.
Therefore, $\sqrt[3]{2^3} = 2$.

Next

$$\begin{aligned} \sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \end{aligned}$$

Cubing a number and finding the cube root of a number are inverse operations. Therefore, $\sqrt[3]{2^3} = 2$.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}$$
$$= -1 \cdot 2$$

$\sqrt[3]{11}$ is in simplest form.

TrueFalse

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2\end{aligned}$$

$\sqrt[3]{11}$ is in simplest form.

- A) True
- B) False

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Topic 1 Content: Simplifying Cube Roots of Integers

Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned} &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \cdot \sqrt[3]{11} \end{aligned}$$

The statement is true. The radicand contains no perfect cube factors other than 1.
Therefore, $\sqrt[3]{11}$ is in the simplest radical form.

True

$$\begin{aligned} \sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \cdot \sqrt[3]{11} \end{aligned}$$

The statement is true. The radicand contains no perfect cube factors other than 1. Therefore, $\sqrt[3]{11}$ is in simplest radical form.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned} &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \cdot \sqrt[3]{11} \end{aligned}$$

In simplest radical form $\sqrt[3]{-88}$ is equivalent to...

$2\sqrt[3]{-11}$

-22

$-2\sqrt[3]{11}$

In simplest radical form $\sqrt[3]{-88}$ is equivalent to...

- A) $-2\sqrt[3]{11}$
- B) -22
- C) $2\sqrt[3]{-11}$

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$$\begin{aligned} &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \cdot \sqrt[3]{11} \\ &= -2\sqrt[3]{11} \end{aligned}$$

In simplest radical form $\sqrt[3]{-88}$ is equivalent to $-2\sqrt[3]{11}$.

$-2\sqrt[3]{11}$

[View Work](#) [Menu](#)

In simplest radical form $\sqrt[3]{-88}$ is equivalent to $-2\sqrt[3]{11}$.

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Example 3 (continued)

EXAMPLE 3

Represent the given expression in simplest radical form: $\sqrt[3]{-88}$

$\sqrt[3]{-88} = \sqrt[3]{-1} \cdot \sqrt[3]{88}$	Apply the Product Property of Radicals.
$= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11}$	Complete the prime factorization of 88.
$= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11}$	Apply the Product Property of Radicals.
$= -1 \cdot 2 \cdot \sqrt[3]{11}$	Simplify the perfect cubes.
$= \boxed{-2\sqrt[3]{11}}$	Simplify the expression.

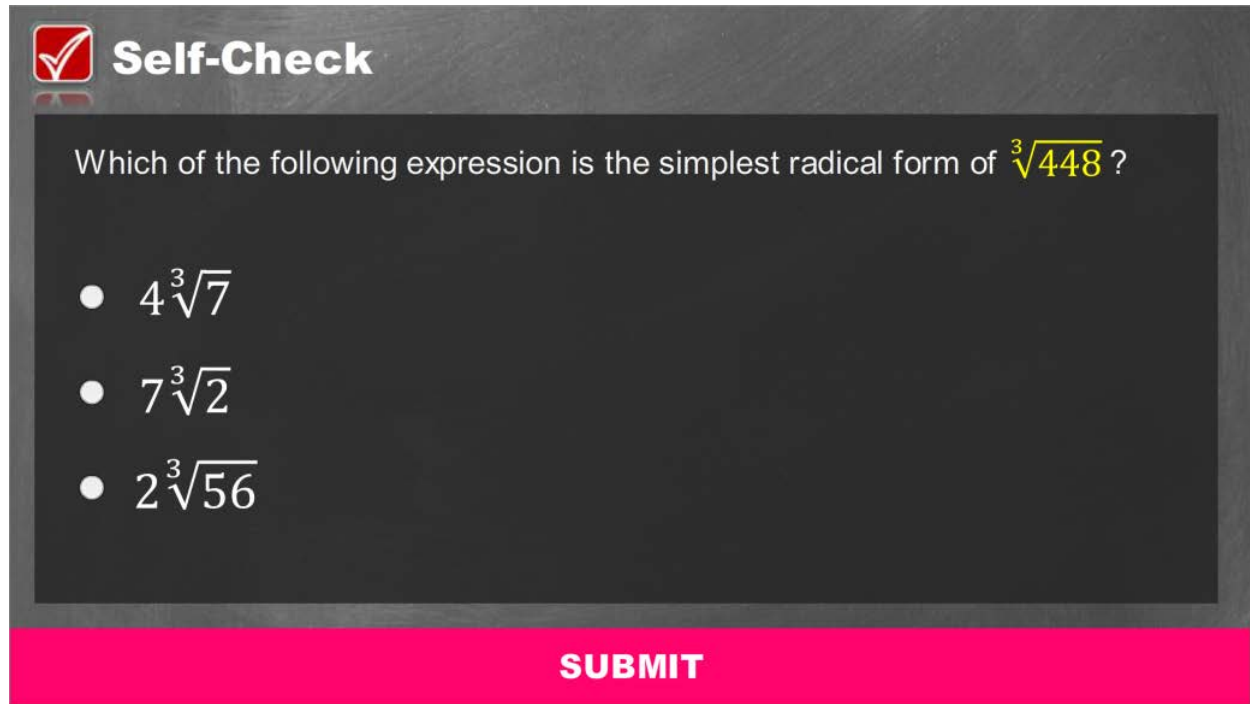
[Menu](#)

$$\begin{aligned}\sqrt[3]{-88} &= \sqrt[3]{-1} \cdot \sqrt[3]{88} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 11} \\ &= \sqrt[3]{-1} \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{11} \\ &= -1 \cdot 2 \cdot \sqrt[3]{11} \\ &= -2\sqrt[3]{11}\end{aligned}$$

Apply the Product Property of Radicals.
Complete the prime factorization of 88.
Apply the Product Property of Radicals.
Simplify the perfect cubes.
Simplify the expression.

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Self-Check 1

A digital interface for a self-check question. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a question is posed in white text: "Which of the following expression is the simplest radical form of $\sqrt[3]{448}$?". Three multiple-choice options are listed, each with a white radio button: $4\sqrt[3]{7}$, $7\sqrt[3]{2}$, and $2\sqrt[3]{56}$. At the bottom of the interface is a bright pink rectangular button with the word "SUBMIT" in white capital letters.

Self-Check

Which of the following expression is the simplest radical form of $\sqrt[3]{448}$?

- $4\sqrt[3]{7}$
- $7\sqrt[3]{2}$
- $2\sqrt[3]{56}$

SUBMIT

Solve the problem in the image above to check your understanding of the content.

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Self-Check 1: Answer

The screenshot shows a self-check interface with a red checkmark icon and the text "Self Check". The main content is a grey box with the following steps and equations:

Correct

That's correct! Follow the steps below to simplify.

Complete the prime factorization of 448. $\sqrt[3]{448} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 7}$

Represent multiple factors as cubes. $= \sqrt[3]{2^3 \cdot 2^3 \cdot 7}$

Apply the Product Property of Radicals. $= \sqrt[3]{2^3} \cdot \sqrt[3]{2^3} \cdot 7$

Simplify the perfect cubes. $= 2 \cdot 2 \cdot 7$

Simplify the expression. $= 4\sqrt[3]{7}$

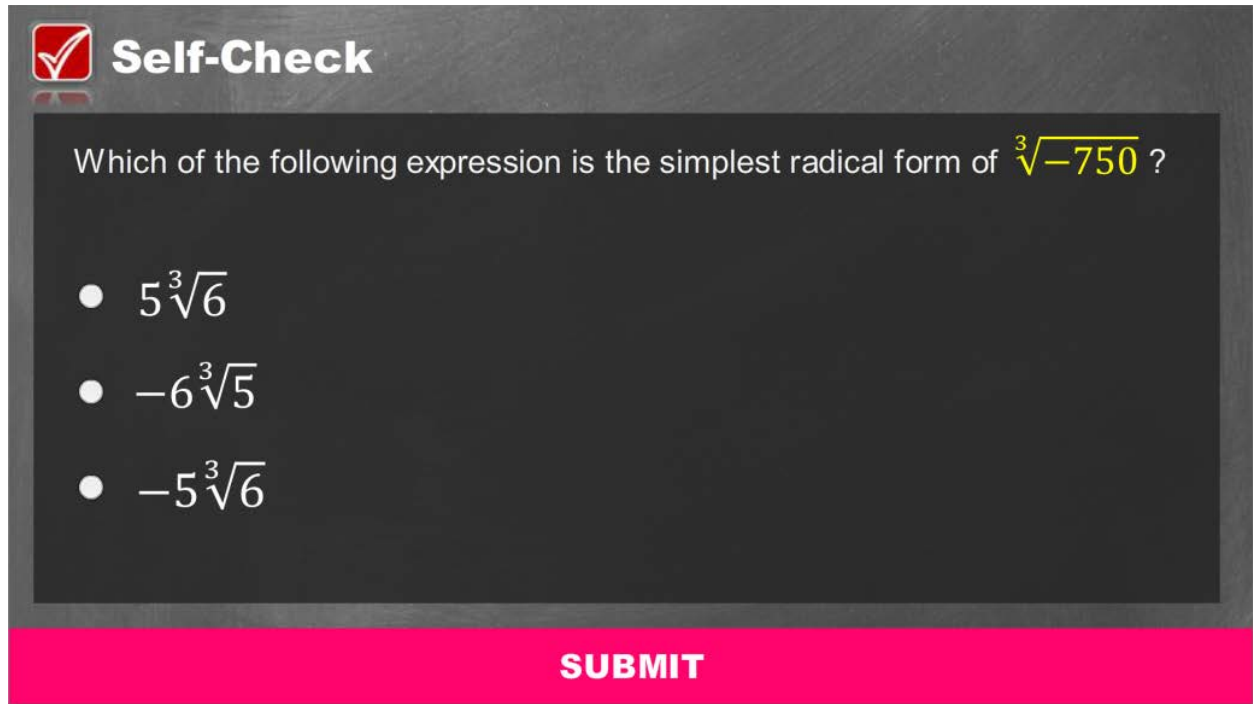
Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

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Self-Check 2



Self-Check

Which of the following expression is the simplest radical form of $\sqrt[3]{-750}$?

- $5\sqrt[3]{6}$
- $-6\sqrt[3]{5}$
- $-5\sqrt[3]{6}$

SUBMIT

Solve the problem in the image above to check your understanding of the content.

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Self-Check 2: Answer

The screenshot shows a self-check interface with a red checkmark icon and the text "Self Check". Below this, the word "Correct" is displayed. The interface provides a step-by-step solution for simplifying the cube root of -750. The steps and corresponding mathematical expressions are as follows:

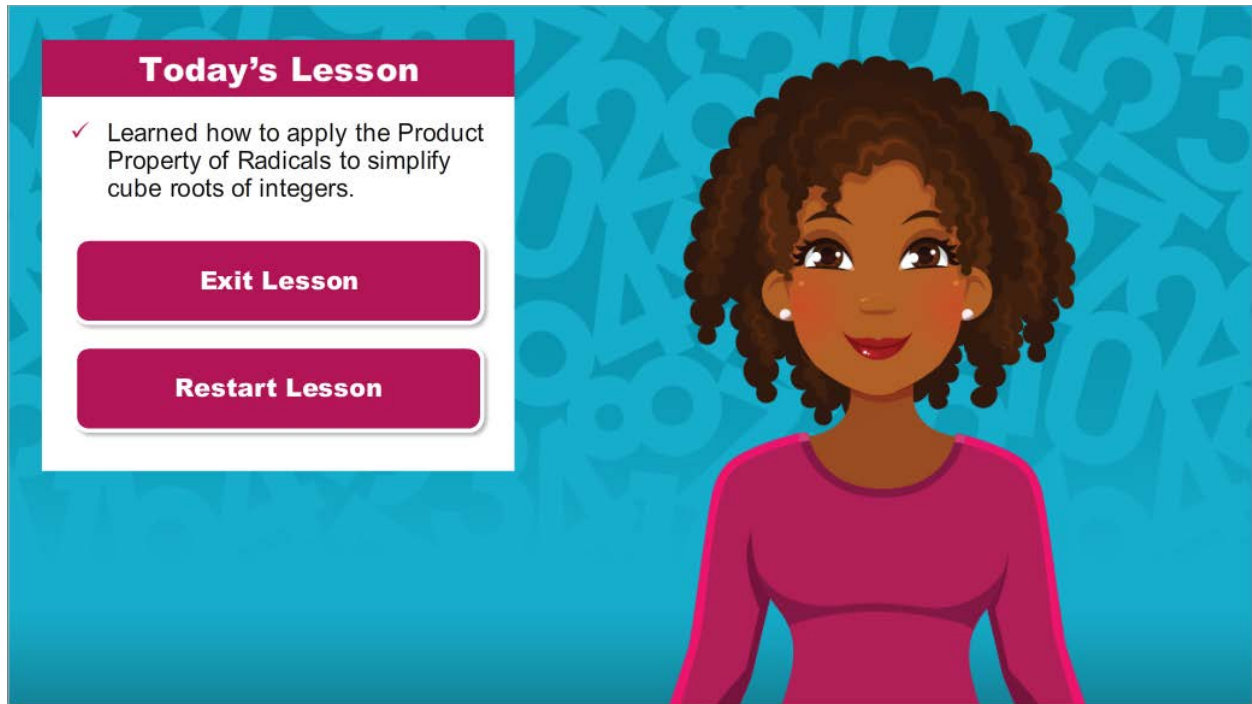
- That's correct! Follow the steps below to simplify.
- Apply the Product Property of Radicals. $\sqrt[3]{-750} = \sqrt[3]{-1} \cdot \sqrt[3]{750}$
- Complete the prime factorization of 750. $= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 3 \cdot 5 \cdot 5 \cdot 5}$
- Apply the Product Property of Radicals. $= \sqrt[3]{-1} \cdot \sqrt[3]{2 \cdot 3} \cdot \sqrt[3]{5^3}$
- Simplify the perfect cubes. $= -1 \cdot \sqrt[3]{6} \cdot 5$
- Apply the Commutative Property of Multiplication. $= -1 \cdot 5 \cdot \sqrt[3]{6}$
- Simplify the expression. $= -5\sqrt[3]{6}$

A "Continue" button is located at the bottom of the solution area. Below the entire interface is a large red button labeled "SUBMIT".

For your reference, the image above shows the correct solution to the self-check problem.

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Conclusion



The image shows a digital lesson conclusion screen. On the left, a white box with a pink header titled "Today's Lesson" contains a checkmark and the text: "Learned how to apply the Product Property of Radicals to simplify cube roots of integers." Below this text are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of the box is a cartoon illustration of a young woman with dark curly hair, wearing a pink long-sleeved shirt, set against a blue background with faint mathematical symbols.

You have reached the conclusion of this lesson where you learned how to apply the Product Property of Radicals to simplify cube roots of integers.