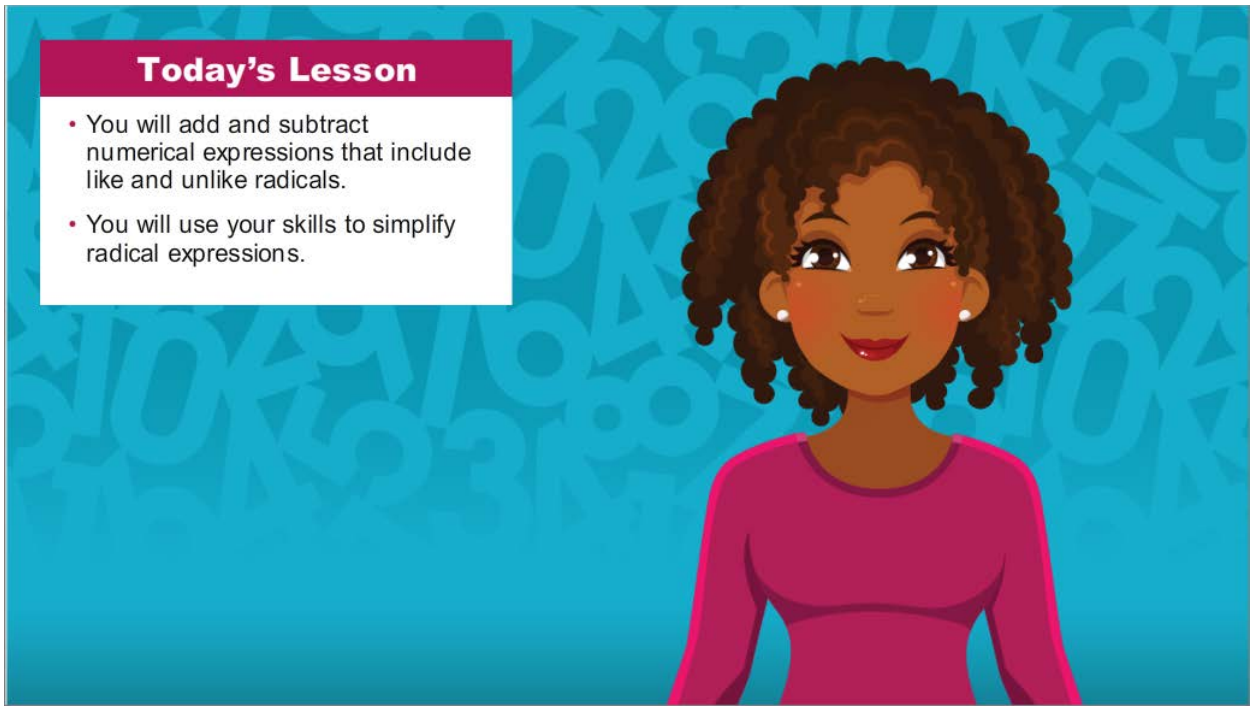
Module 4: Radical Expressions

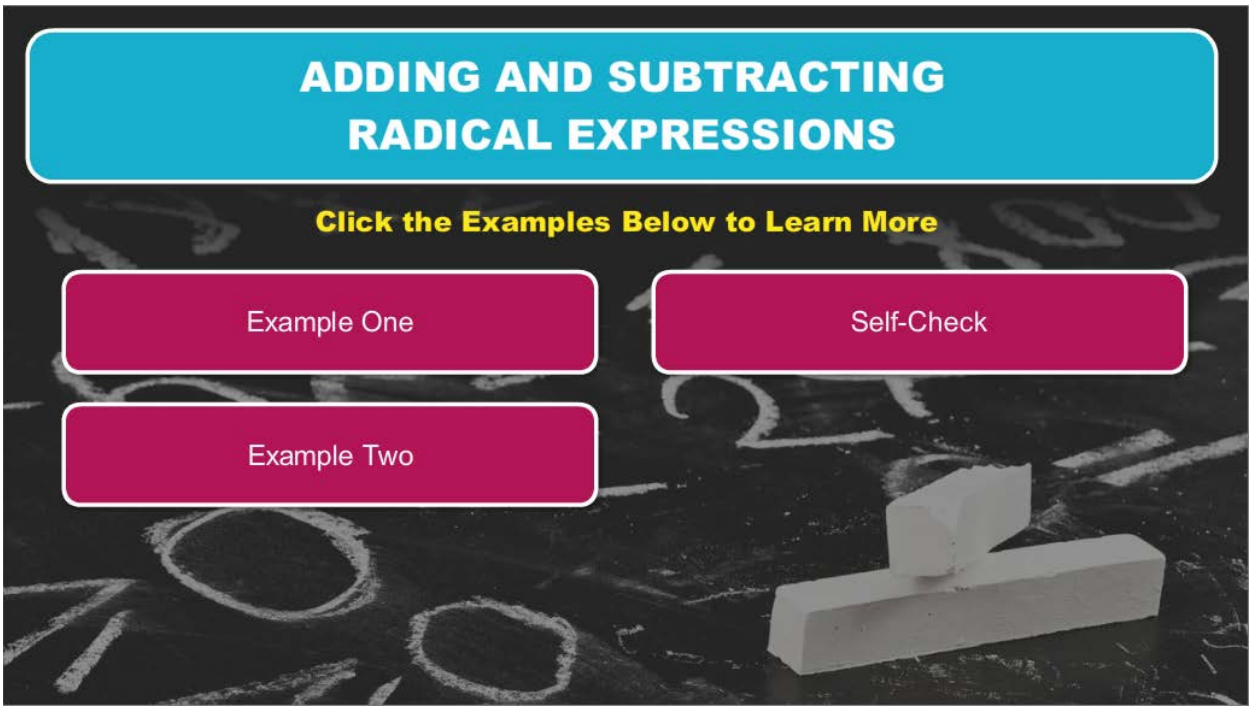
Topic 1 Content: Adding and Subtracting Radical Expressions

Introduction



Hello and welcome! I'm so glad to have you here for this lesson in Algebra I. In this lesson, you will learn how to add and subtract numerical expressions that include like and unlike radicals. Your skills simplifying radical expressions will be a useful resource during this lesson.

Adding and Subtracting Radical Expressions



Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Example 1

Simplify the following expression: $-10\sqrt[3]{7} + 6\sqrt[3]{7}$

To simplify a numerical expression containing like radicals, treat each radical as a variable. Consider this.

If you replaced each radical with the variable, x, you would combine the coefficients to simplify the expression.

$-10 + 6 = -4$

You would then multiply -4 by x. You could then conclude that $-10x + 6x = -4x$.

Essentially what you have done is used the distributive property to factor x out of the expression.

When combining like radicals, you will follow a similar process of treating the radical as you would a variable. Use the distributive property to factor the radical out of the expression and combine the coefficients.

$-10 + 6 = -4$

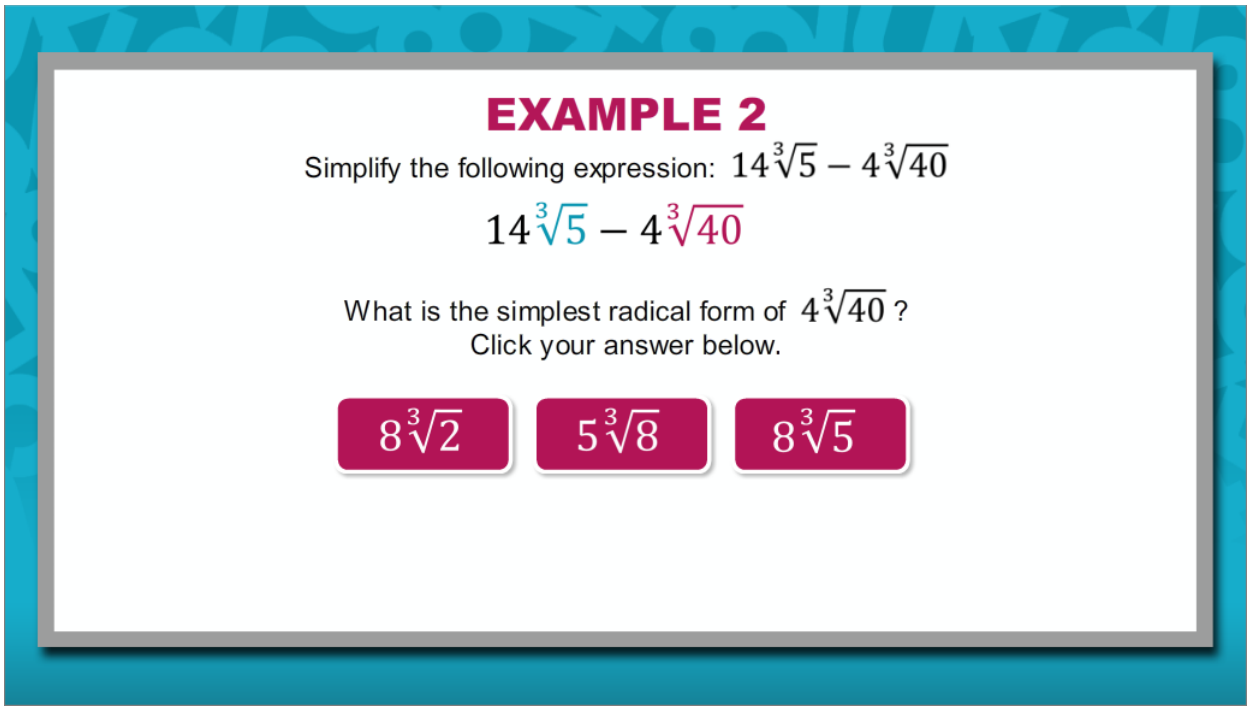
So you can conclude that $-10\sqrt[3]{7} + 6\sqrt[3]{7} = -4\sqrt[3]{7}$.

Steps to solve this problem:

$$-10\sqrt[3]{7} + 6\sqrt[3]{7}$$
$$-10x + 6x$$
$$(-10 + 6)x$$
$$-4x$$

$$-10\sqrt[3]{7} + 6\sqrt[3]{7}$$
$$(-10 + 6)\sqrt[3]{7}$$
$$-4\sqrt[3]{7}$$

Example 2



Simplify the following expression: $14\sqrt[3]{5} - 4\sqrt[3]{40}$

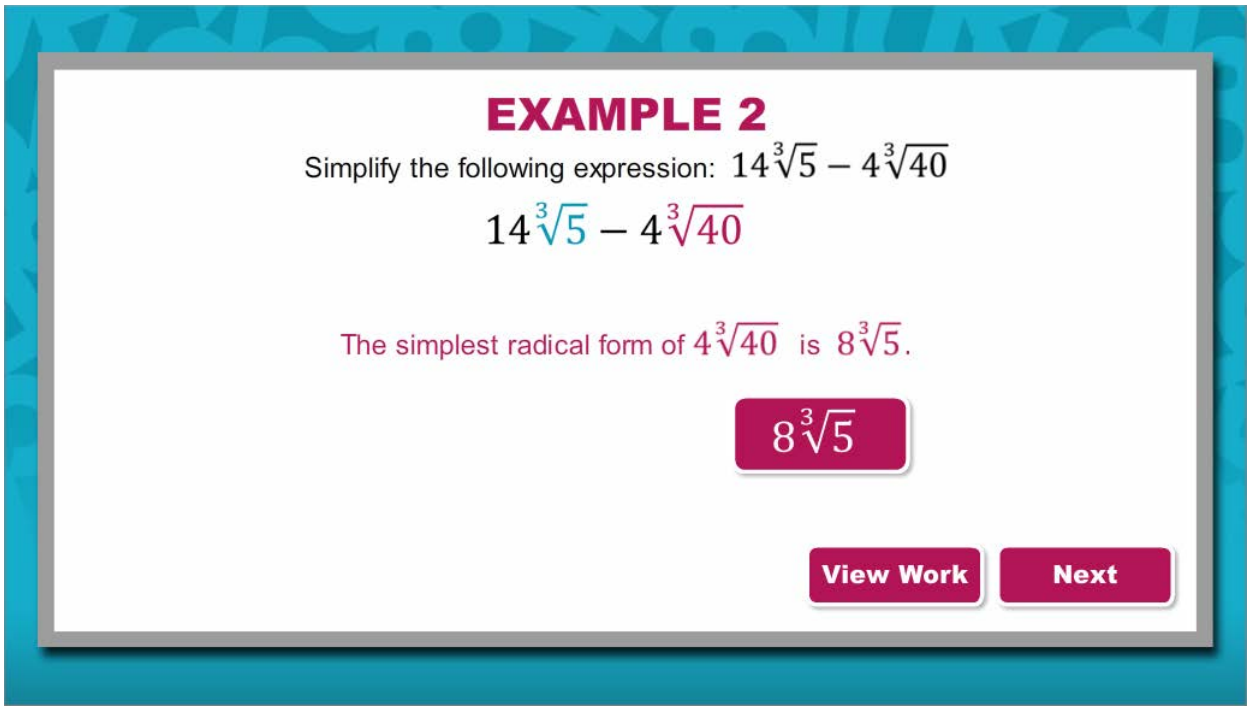
$$14\sqrt[3]{5} - 4\sqrt[3]{40}$$

When a numerical expression includes unlike radicals, the first step is to verify that the radicals are in simplest form. In the given expression, the first radical is in simplest form; the radicand contains no perfect square factors other than 1. The second radical, however, can be simplified.

What is the simplest radical form of $4\sqrt[3]{40}$? Click your answer below.

A) $8\sqrt[3]{2}$
B) $5\sqrt[3]{8}$
C) $8\sqrt[3]{5}$

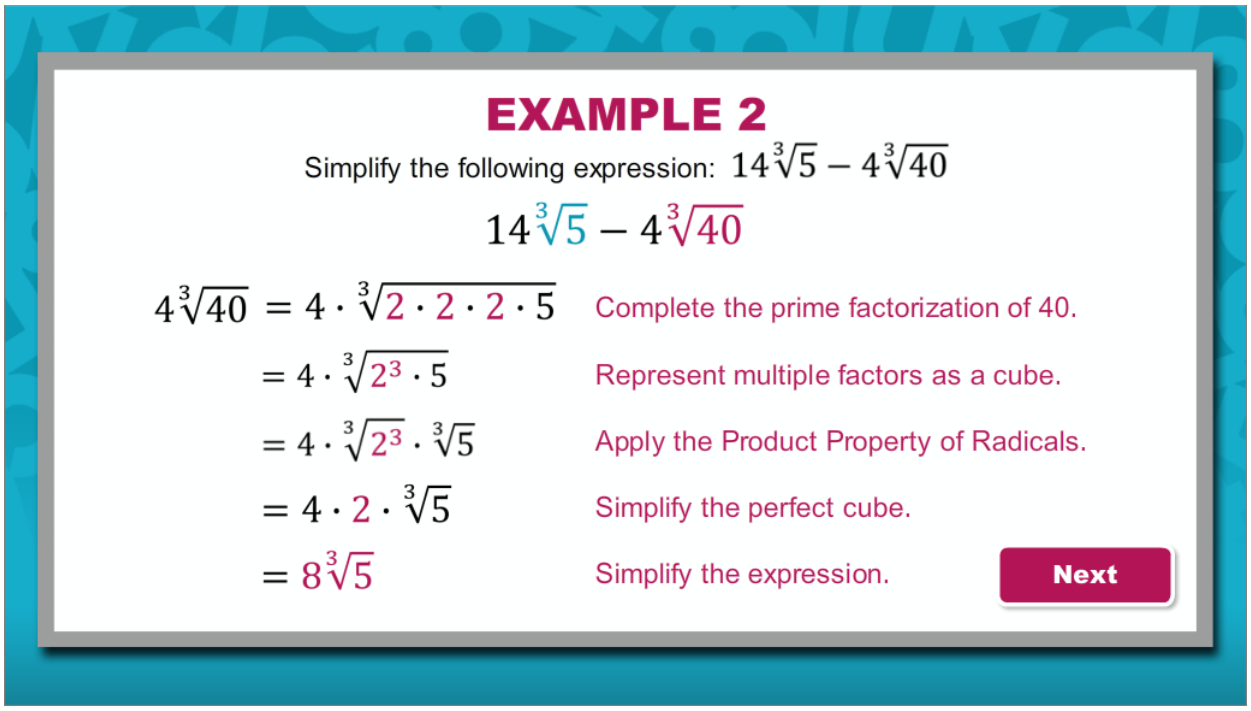
Example 2 (continued)



$$14\sqrt[3]{5} - 4\sqrt[3]{40}$$

The simplest radical form of $4\sqrt[3]{40}$ is $8\sqrt[3]{5}$.

Example 2 (continued)



$$14\sqrt[3]{5} - 4\sqrt[3]{40}$$

$4\sqrt[3]{40} = 4 \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 5}$ Complete the prime factorization of 40.

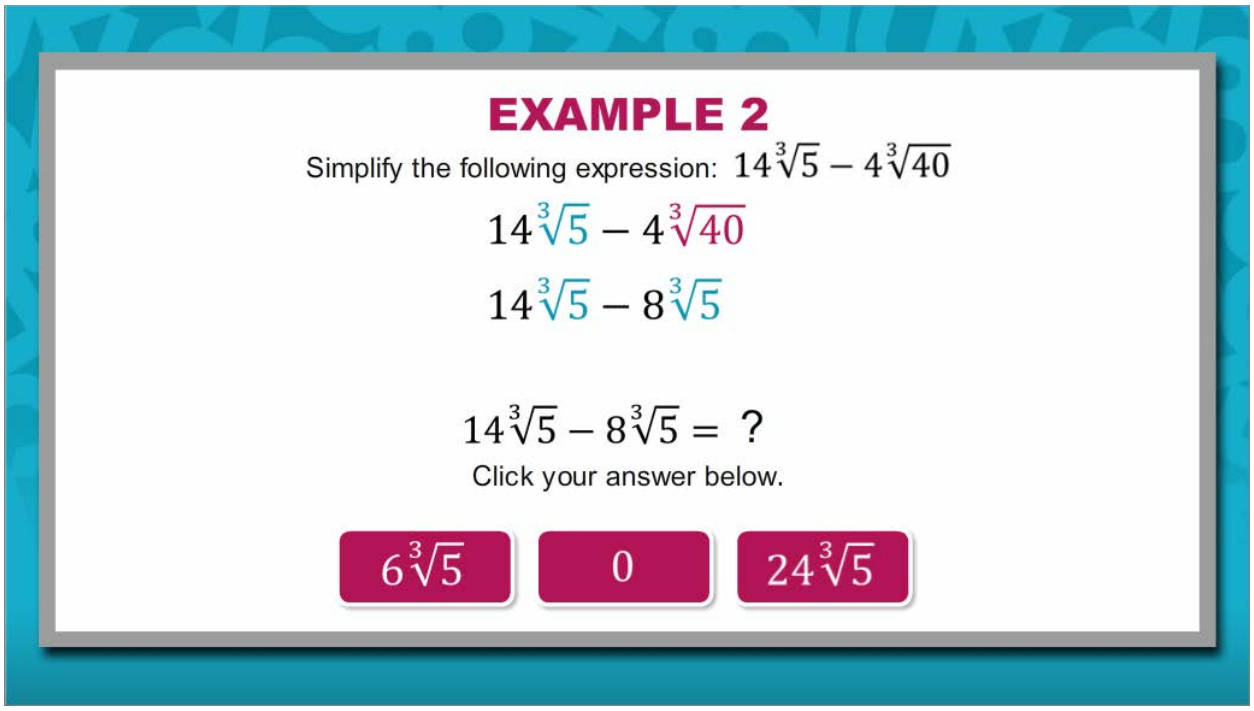
$= 4 \cdot \sqrt[3]{2^3 \cdot 5}$ Represent multiple factors as a cube.

$= 4 \cdot \sqrt[3]{2^3} \cdot \sqrt[3]{5}$ Apply the Product Property of Radicals.

$= 4 \cdot 2 \cdot \sqrt[3]{5}$ Simplify the perfect cube.

$= 8\sqrt[3]{5}$ Simplify the expression.

Example 2 (continued)



$$14\sqrt[3]{5} - 4\sqrt[3]{40}$$
$$14\sqrt[3]{5} - 8\sqrt[3]{5}$$

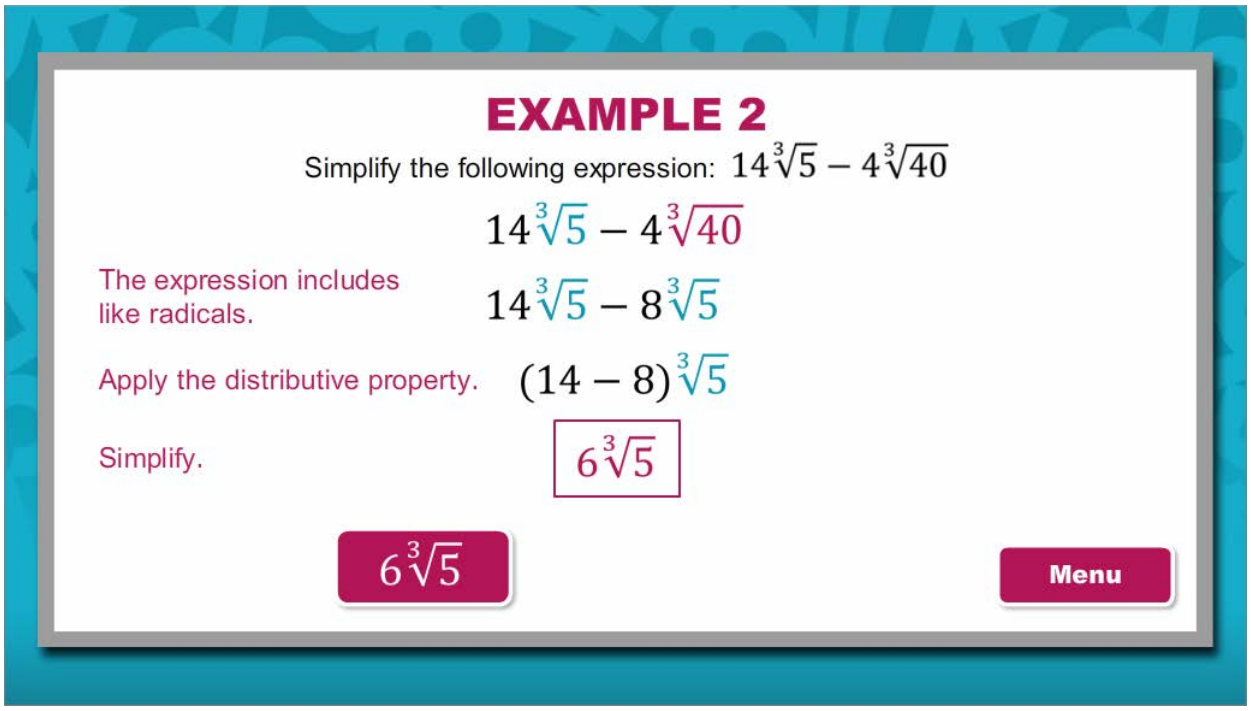
In the expression, replace $4\sqrt[3]{40}$ with $8\sqrt[3]{5}$. Notice that the expression now includes like radicals. Apply the distributive property to subtract the radical expressions.

$$14\sqrt[3]{5} - 8\sqrt[3]{5} = ?$$

Click your answer below.

A) $6\sqrt[3]{5}$
B) 0
C) $24\sqrt[3]{5}$

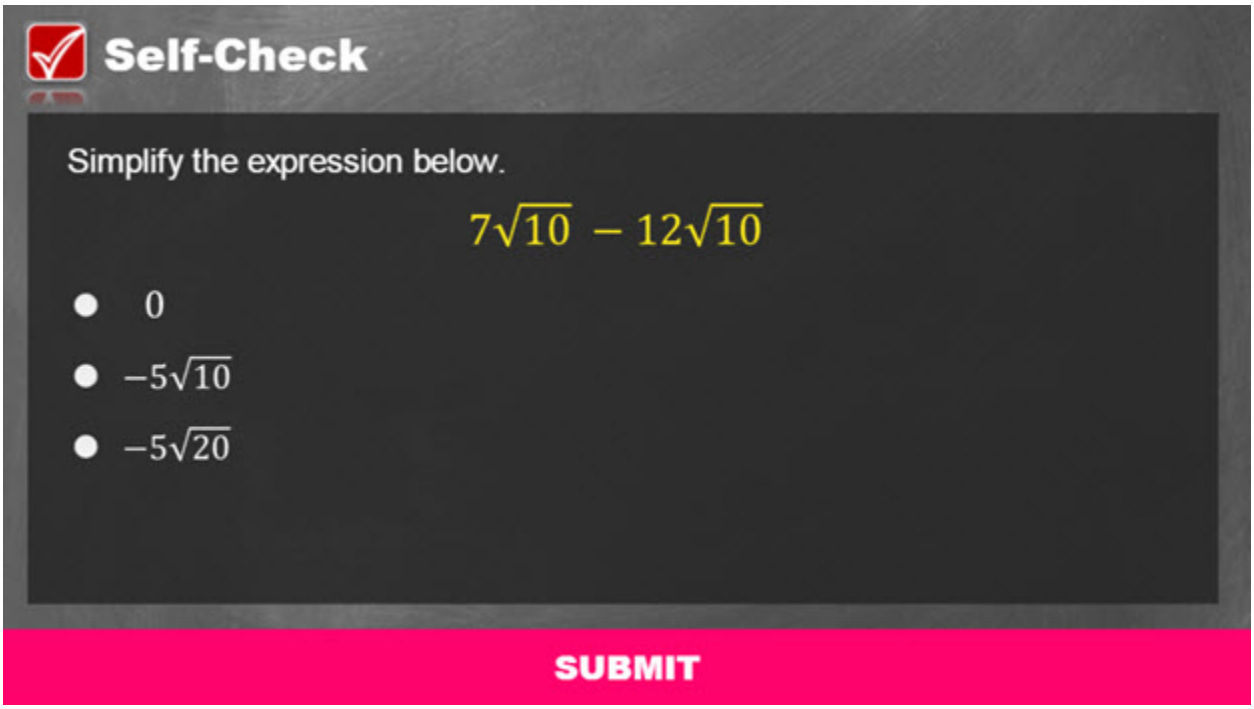
Example 2 (continued)



$14\sqrt[3]{5} - 4\sqrt[3]{40}$

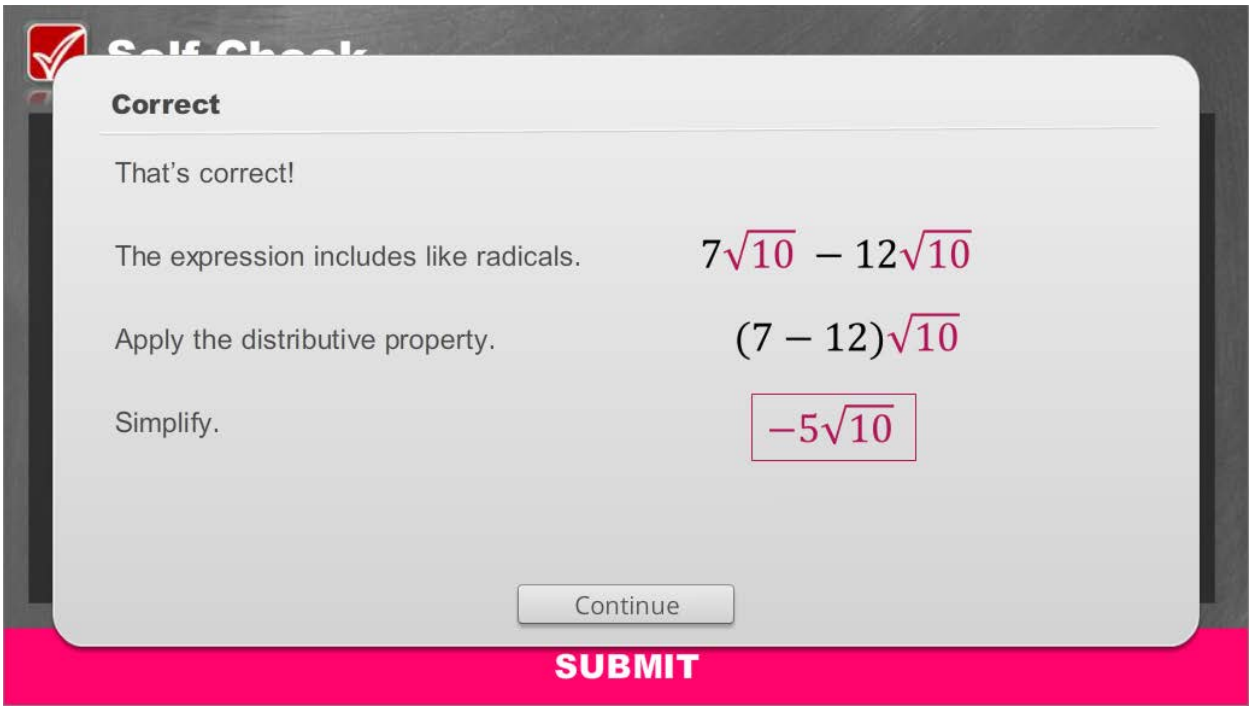
$14\sqrt[3]{5} - 8\sqrt[3]{5}$ The expression includes like radicals.
$(14 - 8)\sqrt[3]{5}$ Apply the distributive property.
$6\sqrt[3]{5}$ Simplify.

Self-Check 1



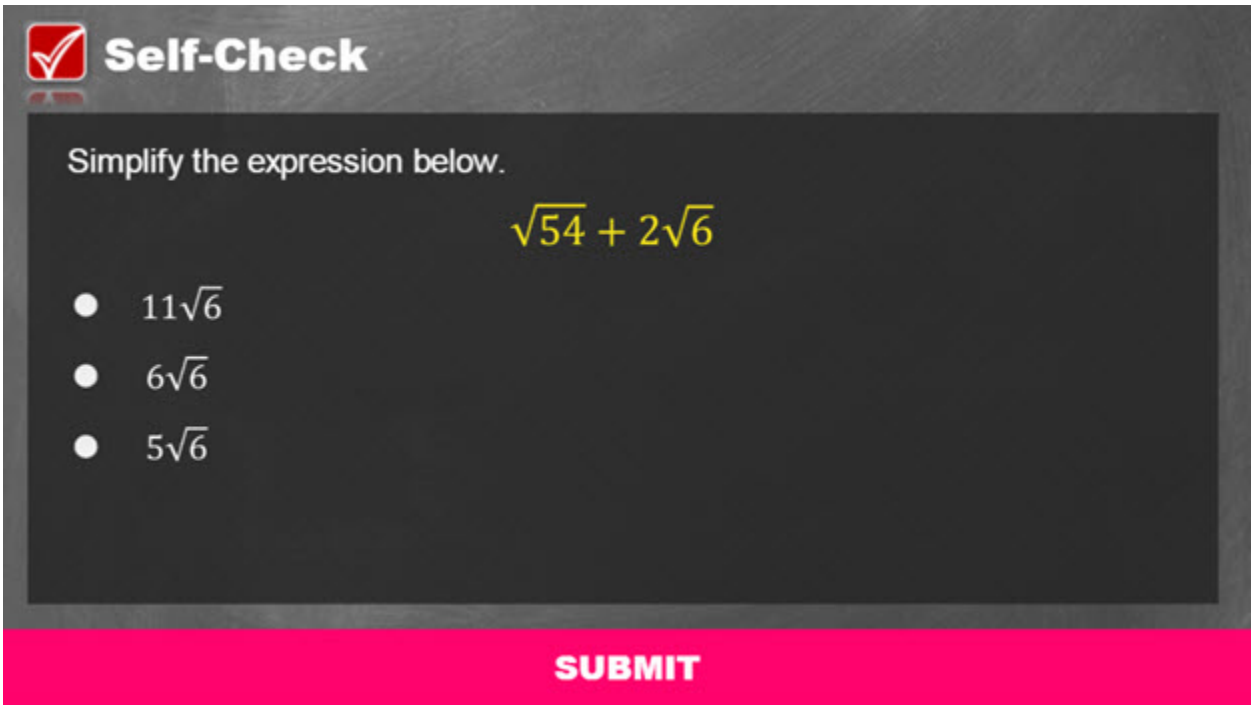
Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



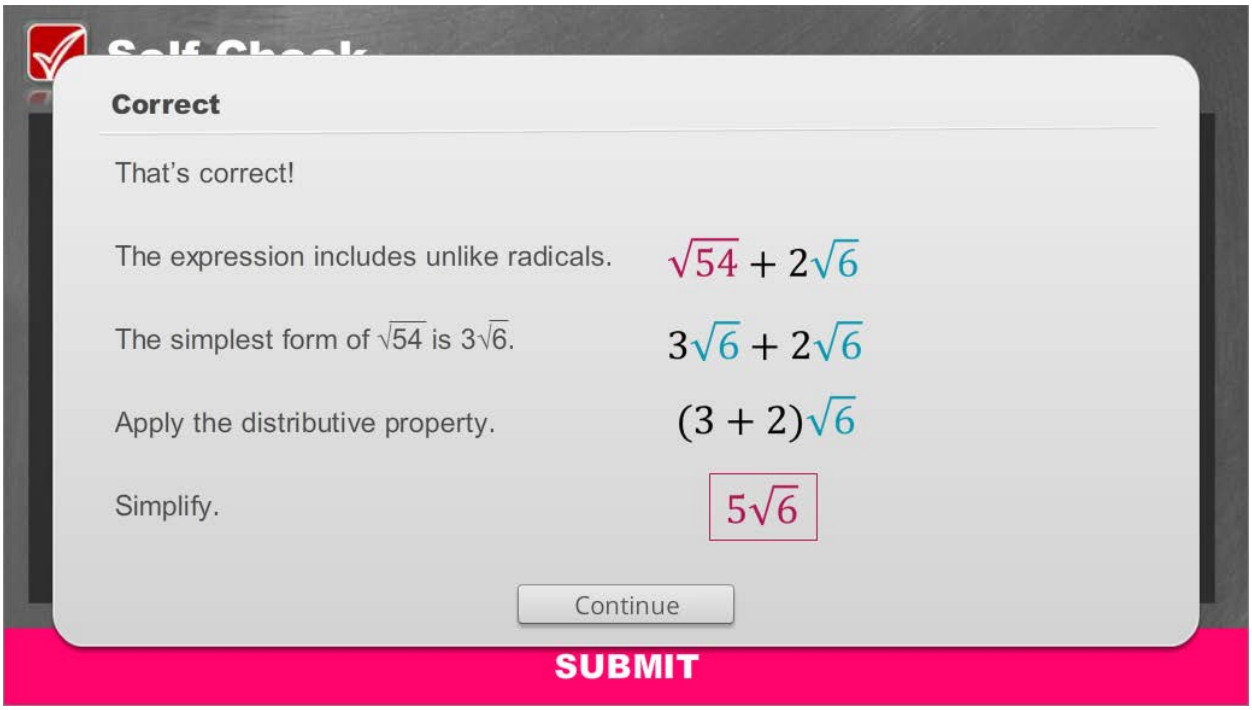
For your reference, the image above shows the correct solution to the self-check problem.

Self-Check 2



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

Self-Check 2: Answer



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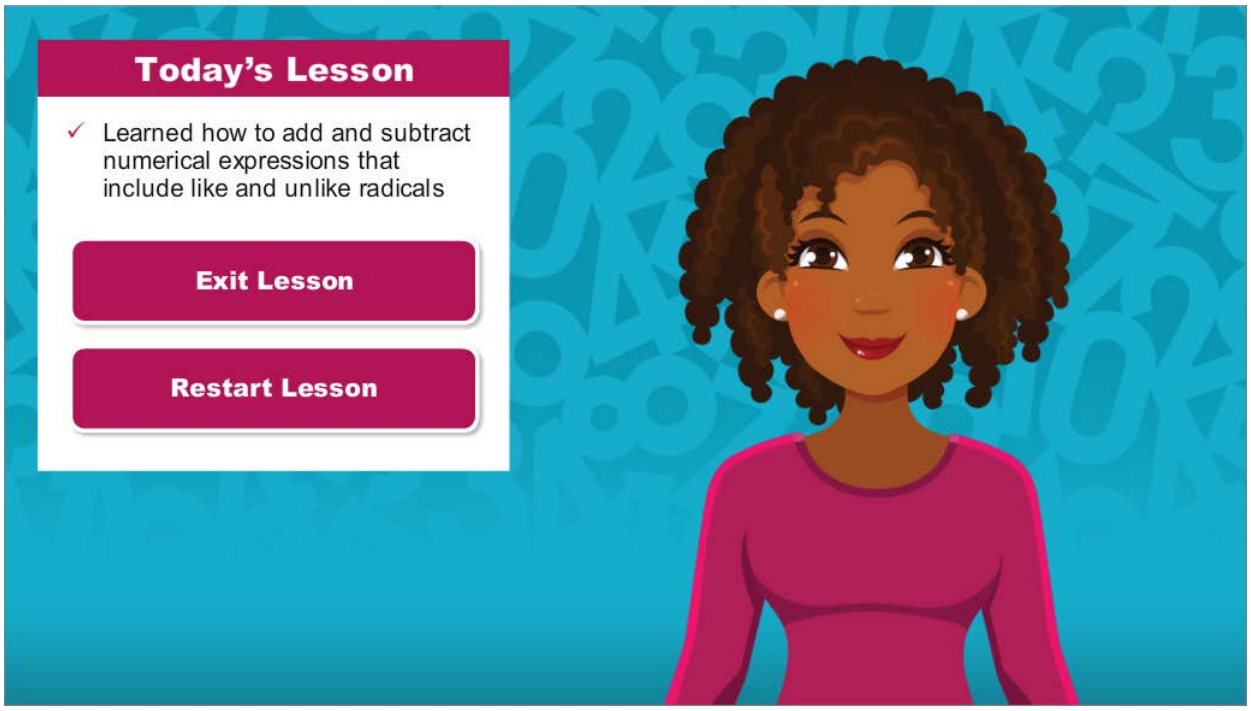
Conclusion



You have reached the conclusion of this lesson where you learned how to add and subtract numerical expressions that include like and unlike radicals.