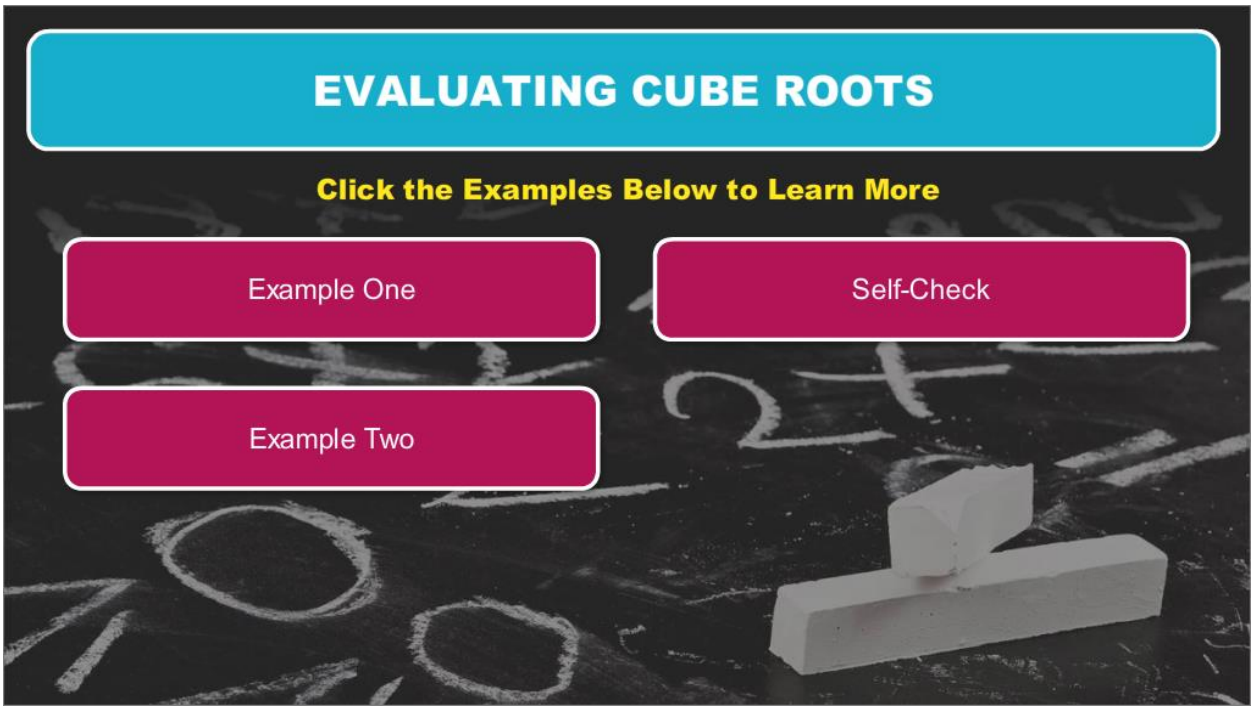
Module 1: Expressions
Topic 3: Evaluating Cube Roots

Introduction

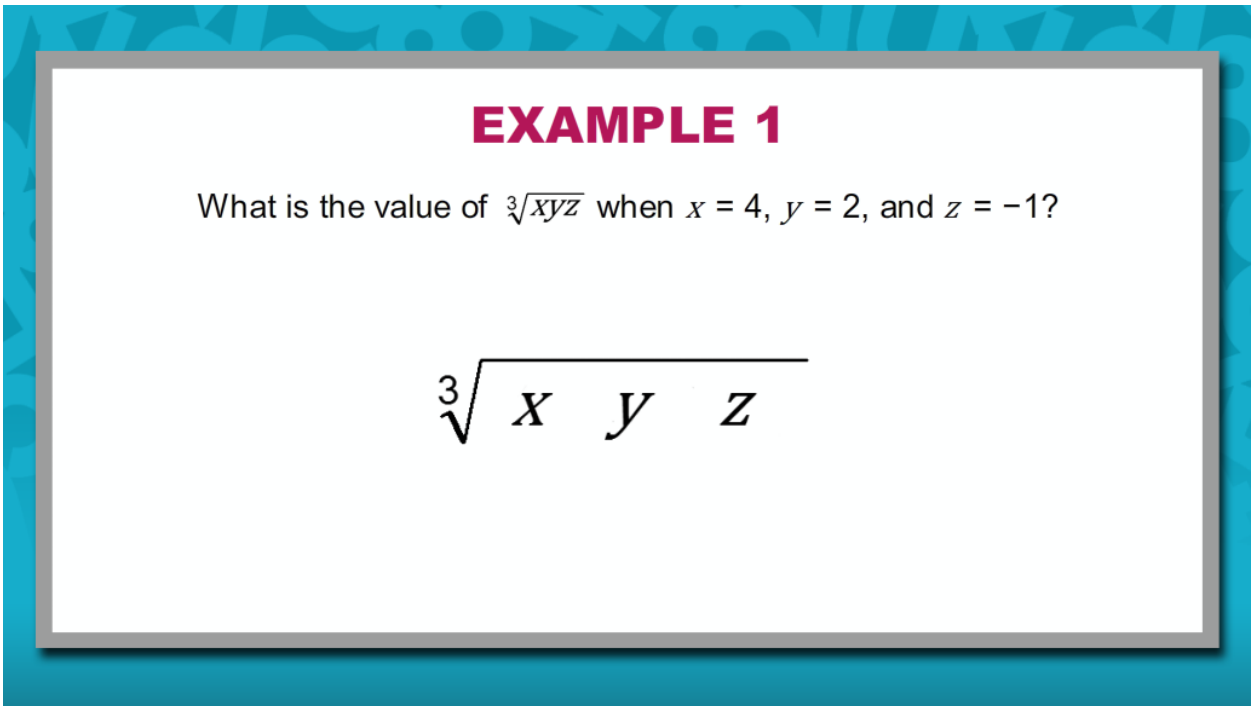
Hello and welcome! I'm glad to have you here for this lesson in Algebra I, where you will apply your knowledge of the order of operations and cube roots to evaluate algebraic expressions for given replacement values.

Evaluating Cube Roots



Click the examples below to learn more.

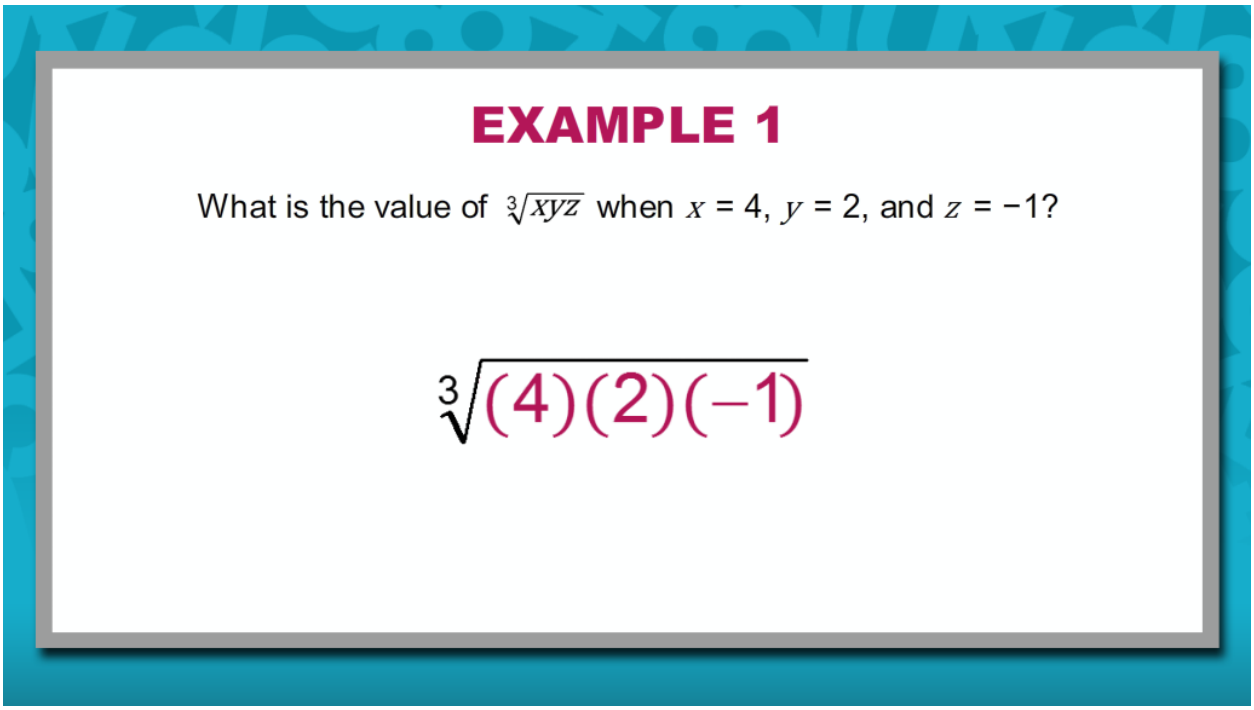
Example 1



What is the value of $\sqrt[3]{xyz}$, when $x = 4$, $y = 2$, and $z = -1$?

To answer this question, you must begin by substituting the replacement values into the expression. Place 4 in the place of x, 2 in the place of y, and -1 in the place of z. According to the order of operations, you must begin by simplifying the expression under the cube root symbol.

Example 1 (continued)



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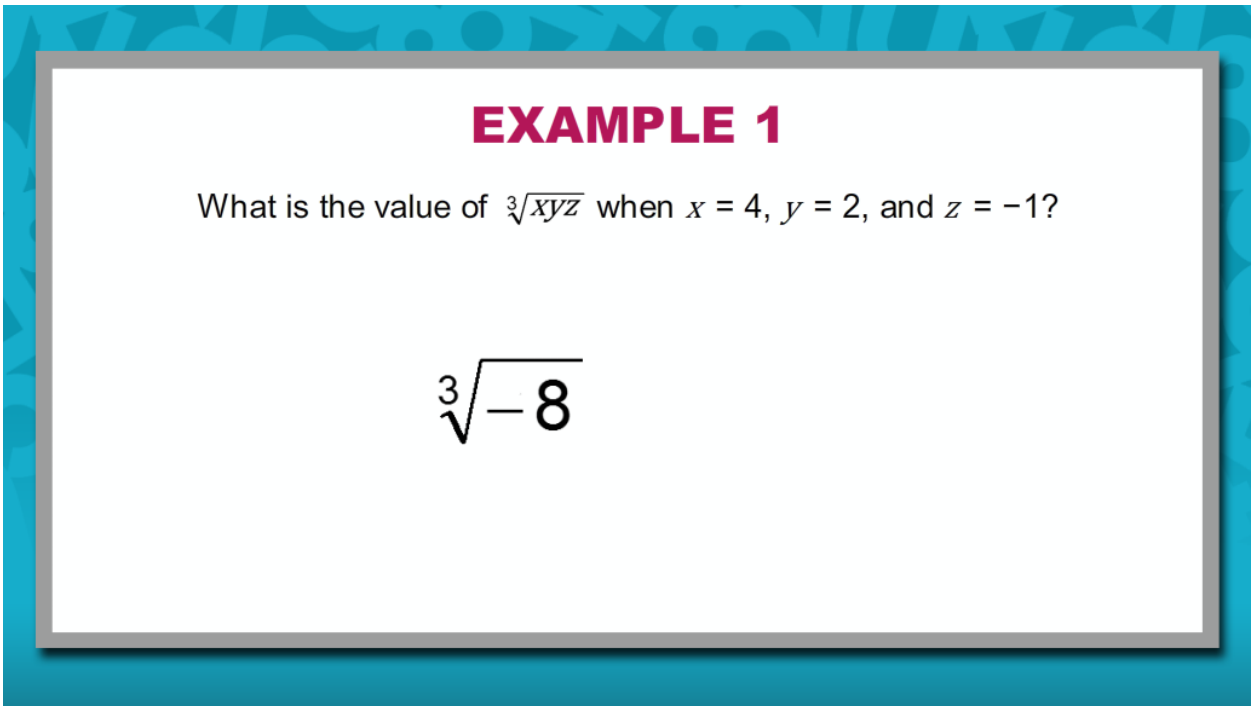
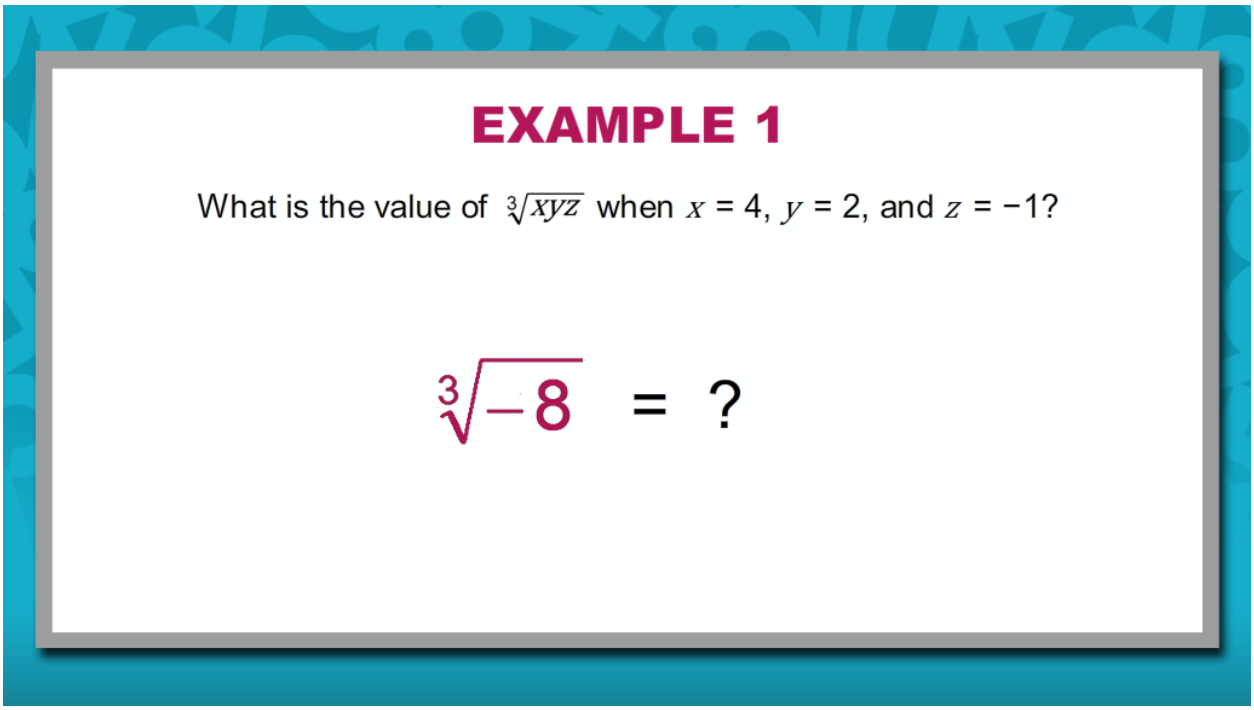
Example 1 (continued)



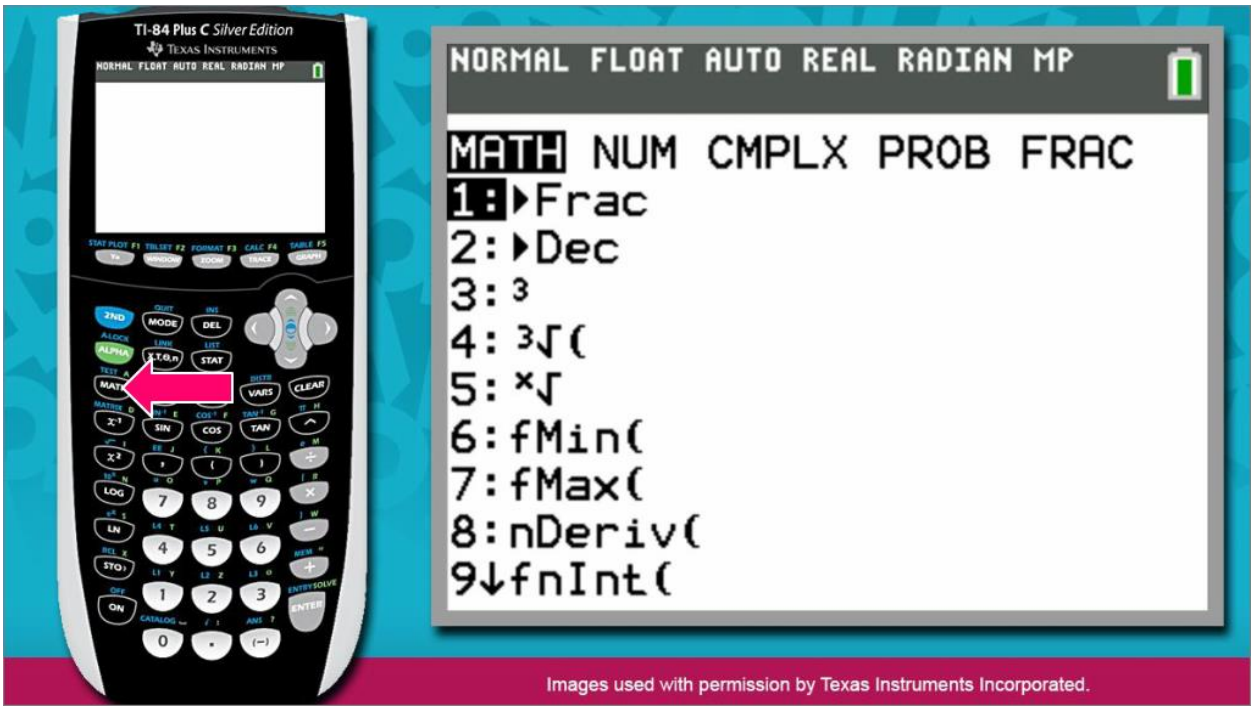
$(4)(2)(-1)$ is -8. Now that you have performed the necessary multiplication, you are ready to take the cube root.

Example 1 (continued)



What is the cube root of -8 ? Or in other words, what number raised to the third power equals -8?

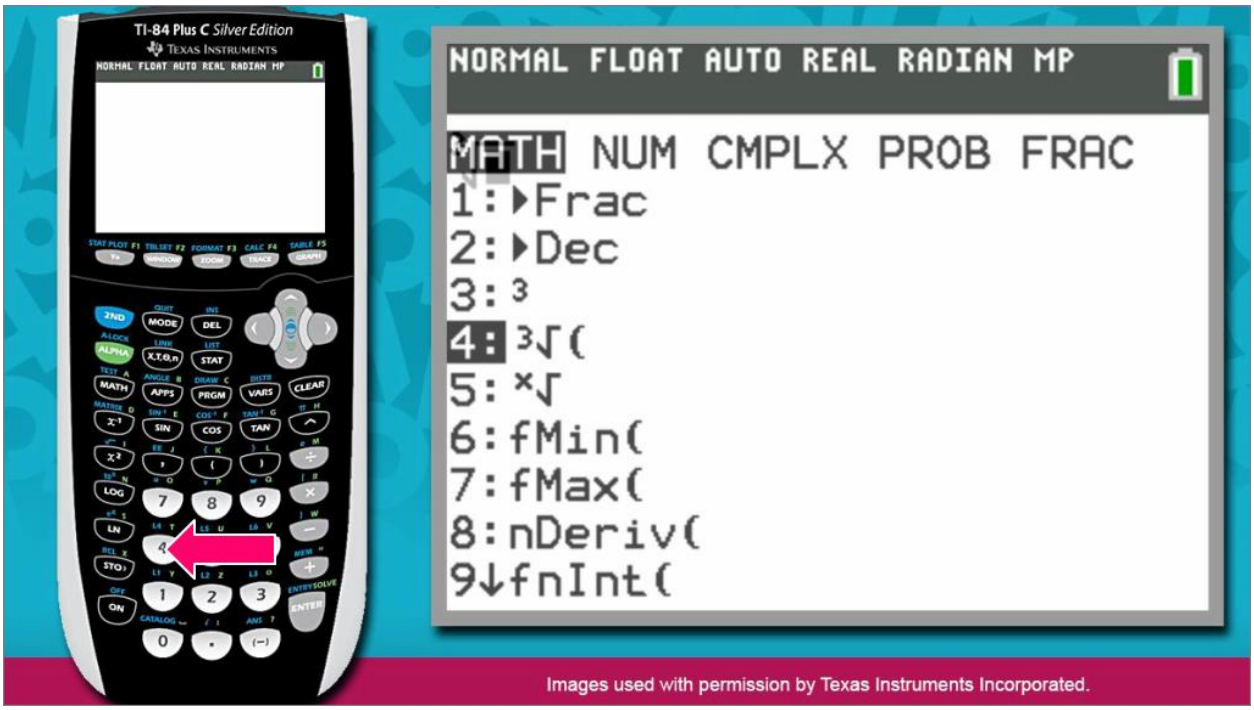
Example 1 (continued)



You may use paper and pencil to determine this answer, or you may want to use the cube root function in the calculator.

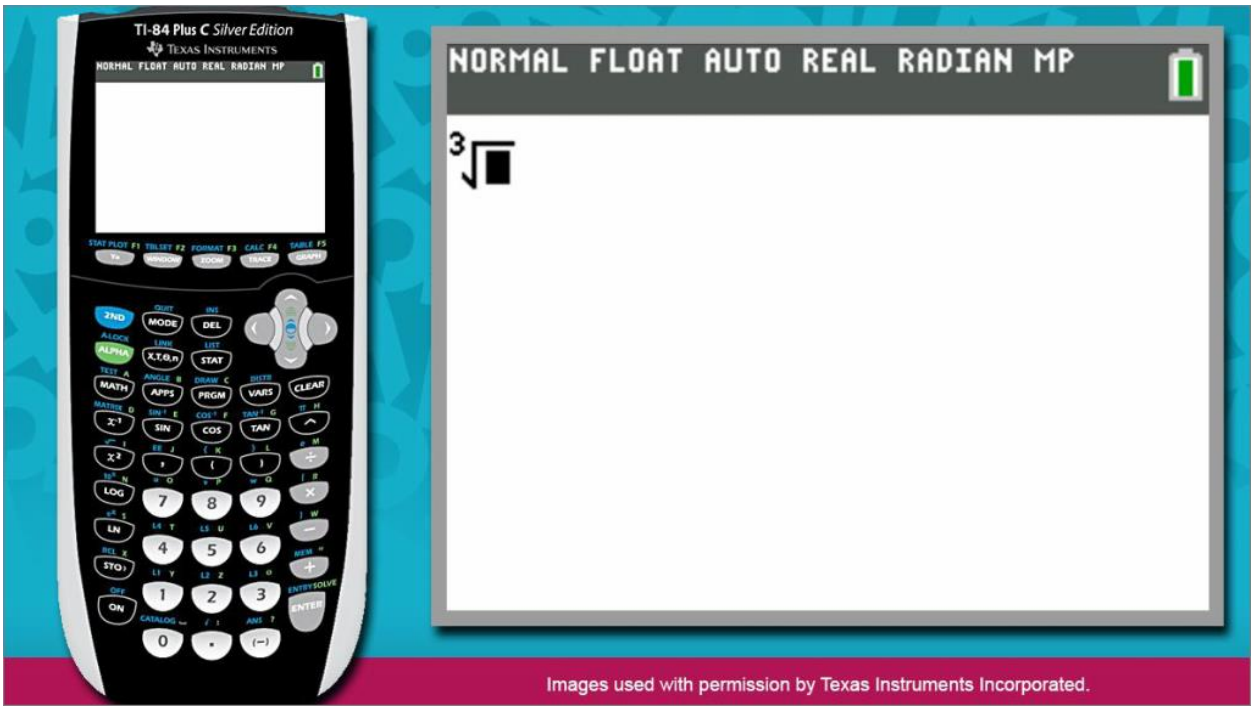
Press the MATH key, located directly below the green ALPHA key. This button will allow you to view some additional functions that the calculator is able to perform.

Example 1 (continued)



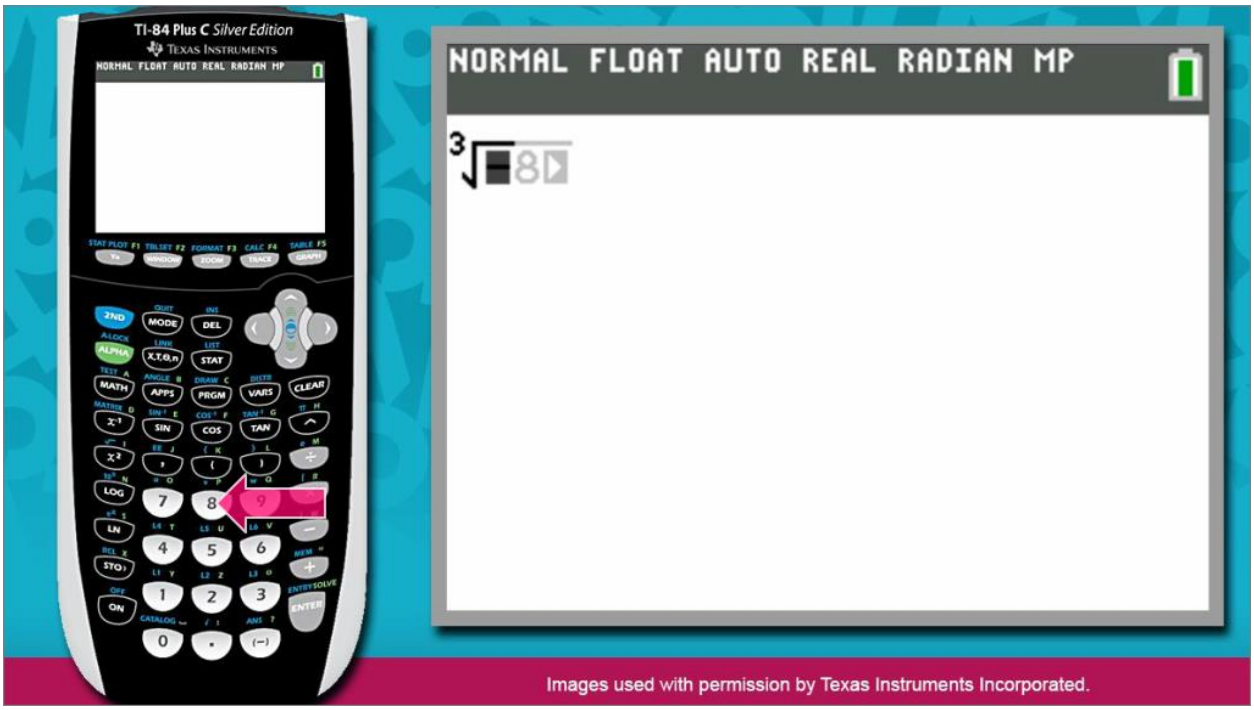
The cube root function is the fourth option in the list. Press 4 to select it.

Example 1 (continued)



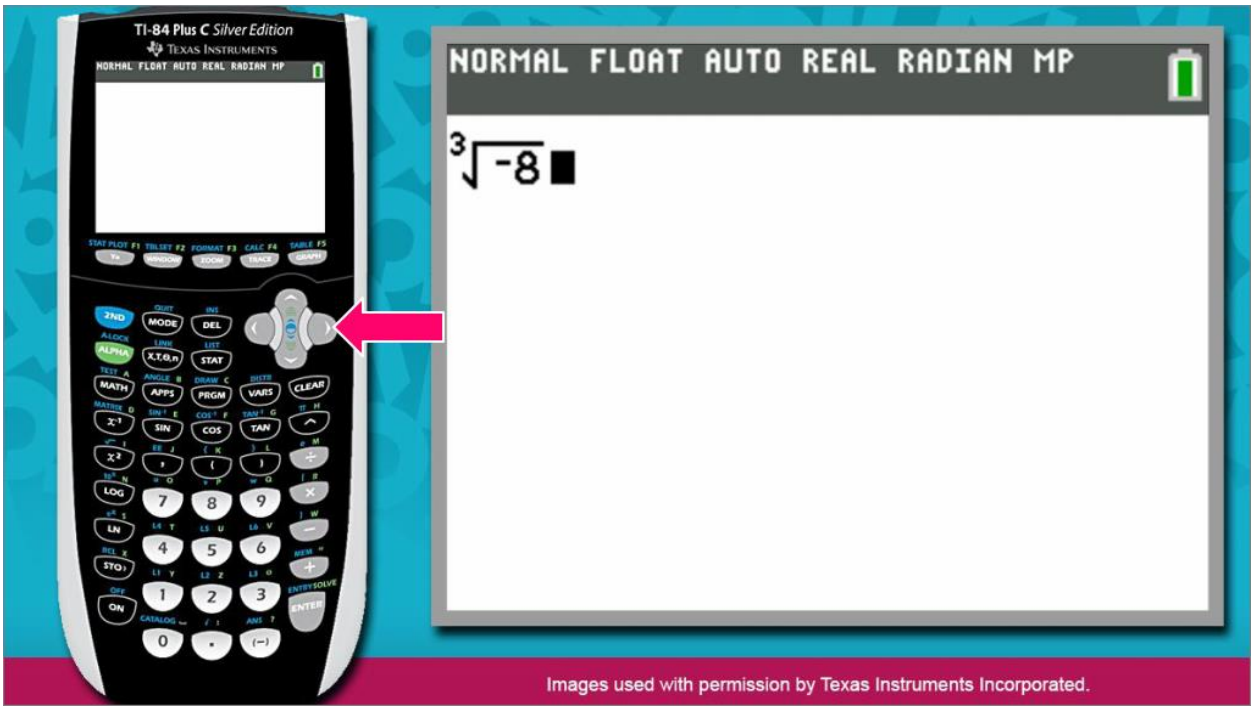
Notice that the calculator has returned to the home screen, ready to take the cube root of the value you enter next.

Example 1 (continued)



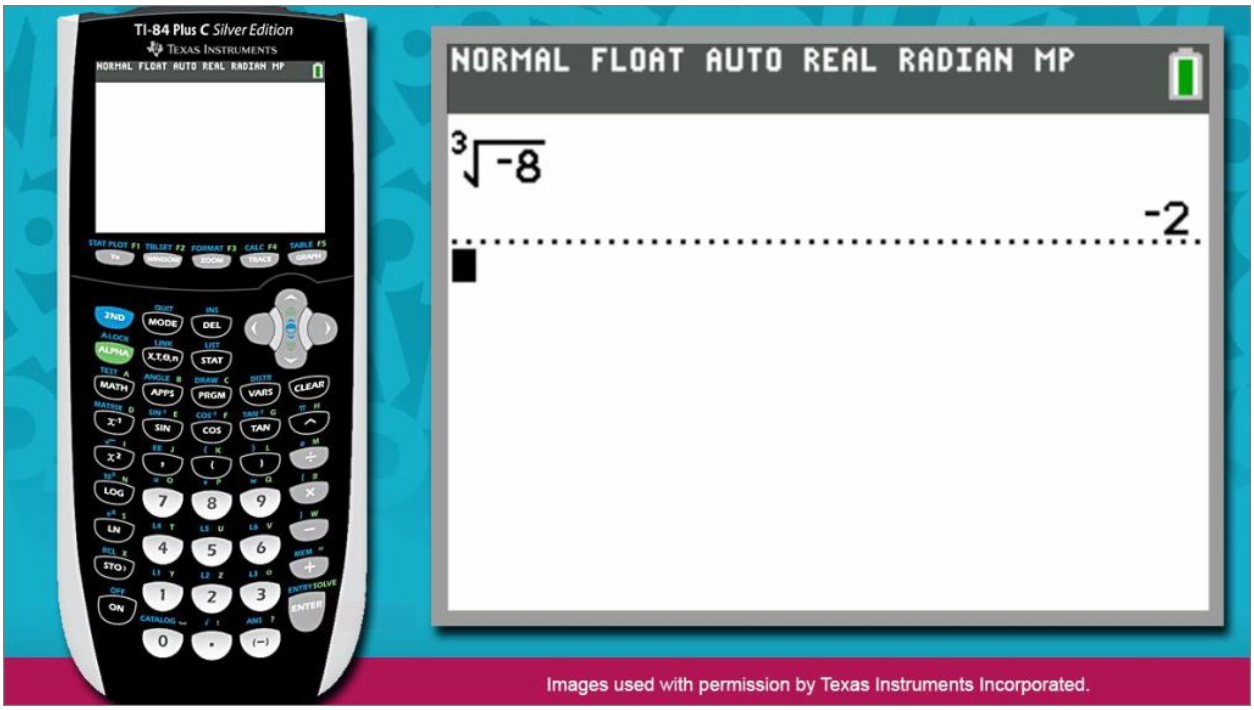
Press the negative key, located underneath the 3 key, then press 8. You will notice the cursor change to a right arrow. This is the calculator's way of alerting you to press the right arrow key if you have finished entering in the value within the cube root symbol.

Example 1 (continued)



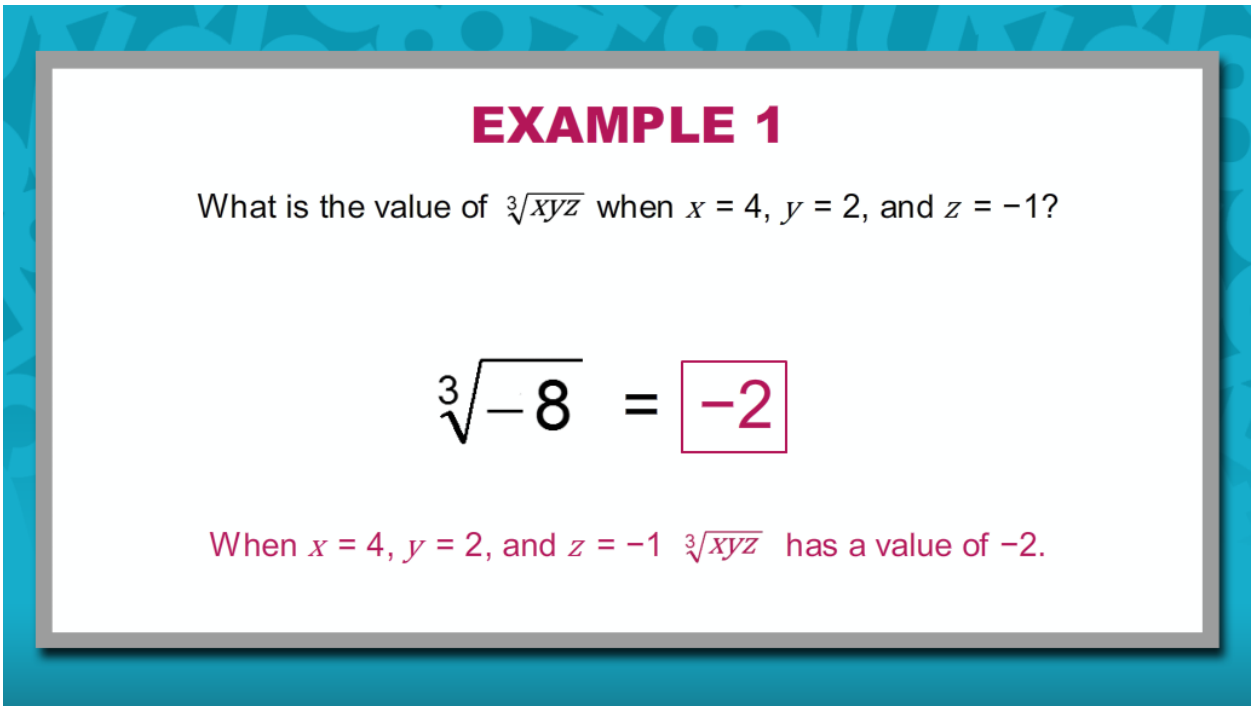
Because you have finished entering in this value, press the right arrow key. You will notice the cursor move to the right of the expression.

Example 1 (continued)



Now press enter. The cube root of -8 is -2.

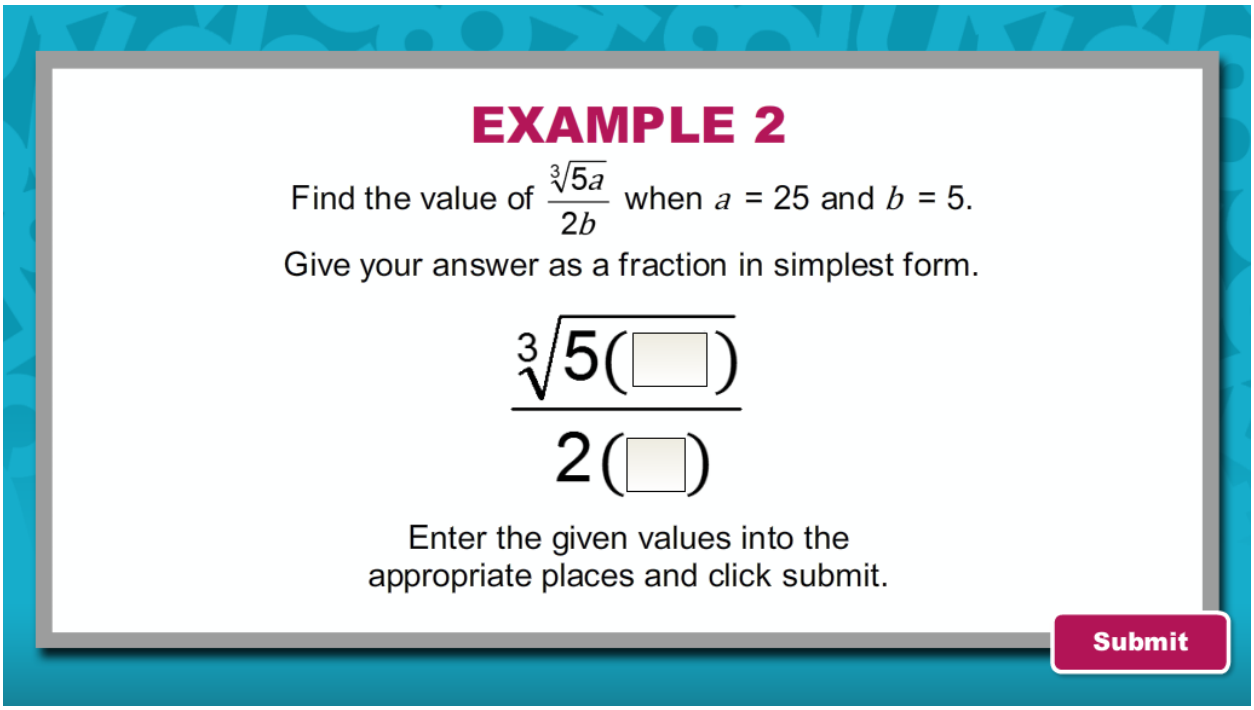
Example 1 (continued)



Your work is complete.

When $x = 4$, $y = 2$, and $z = -1$, $\sqrt[3]{xyz}$ has a value of -2.

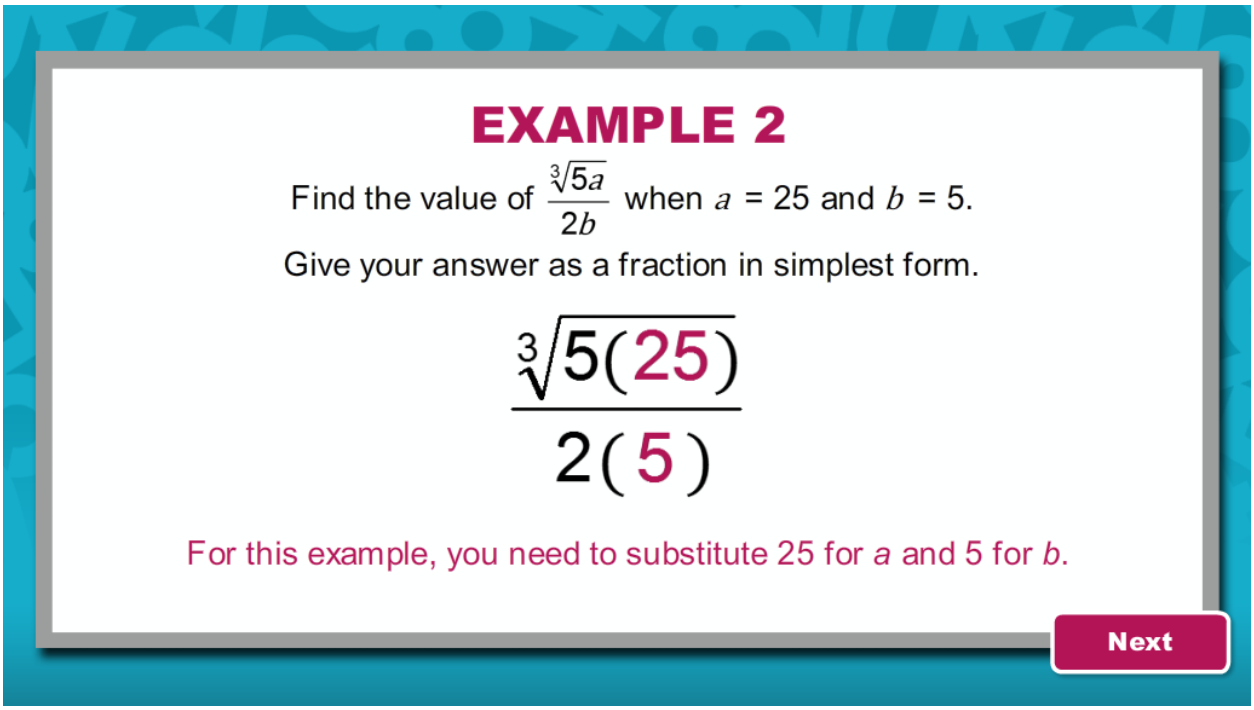
Example 2



Begin by substituting the replacement values.

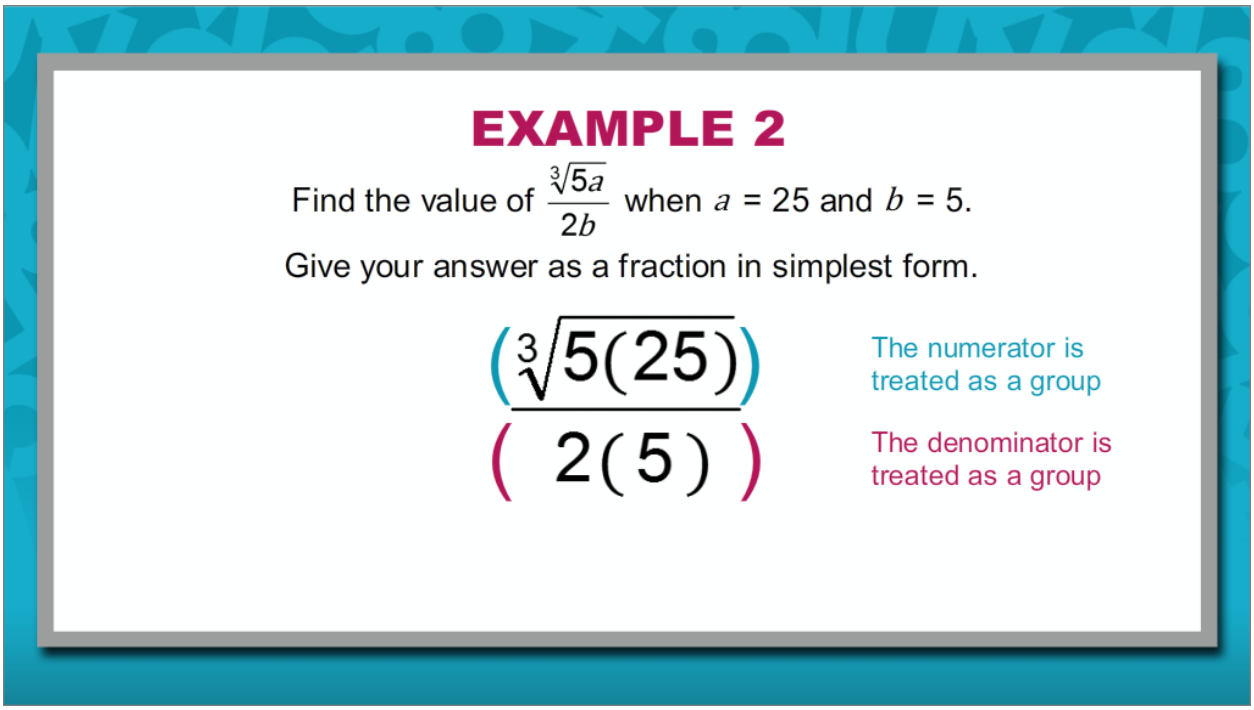
Enter the given values into the appropriate places and click submit.

Example 2 (continued)



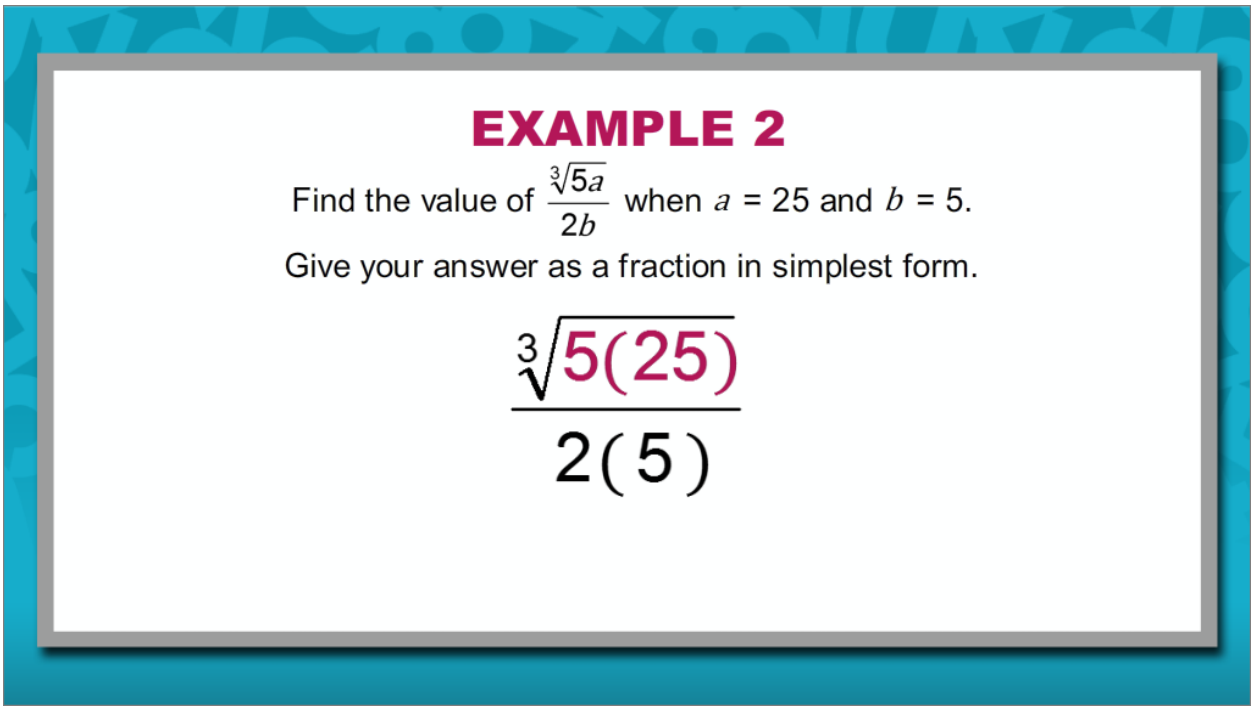
Feedback: For this example, you need to substitute 25 for a and 5 for b.

Example 2 (continued)



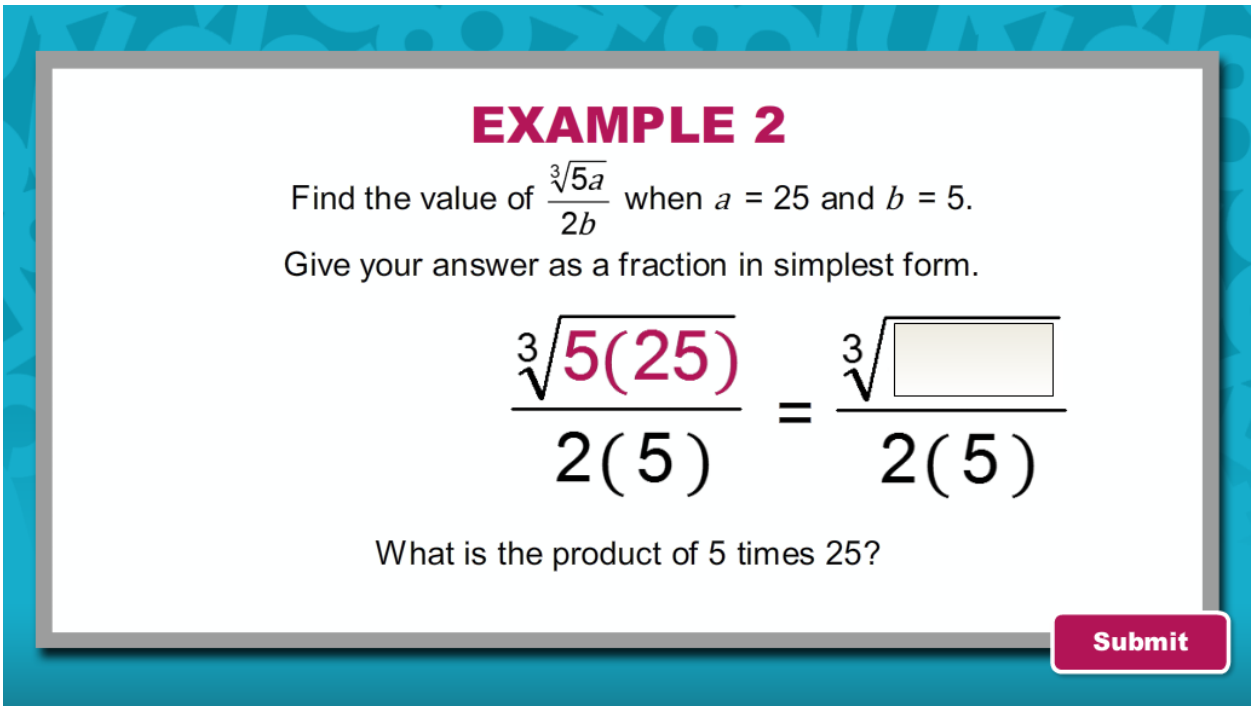
Now use the order of operations to simplify the expression. Remember that when simplifying an expression that includes a division bar, the expressions in the numerator and denominator are treated as groups. So according to the order of operations, you must simplify these expressions first.

Example 2 (continued)



In the numerator, you must simplify the product within the cube root symbol before you are able to take the cube root.

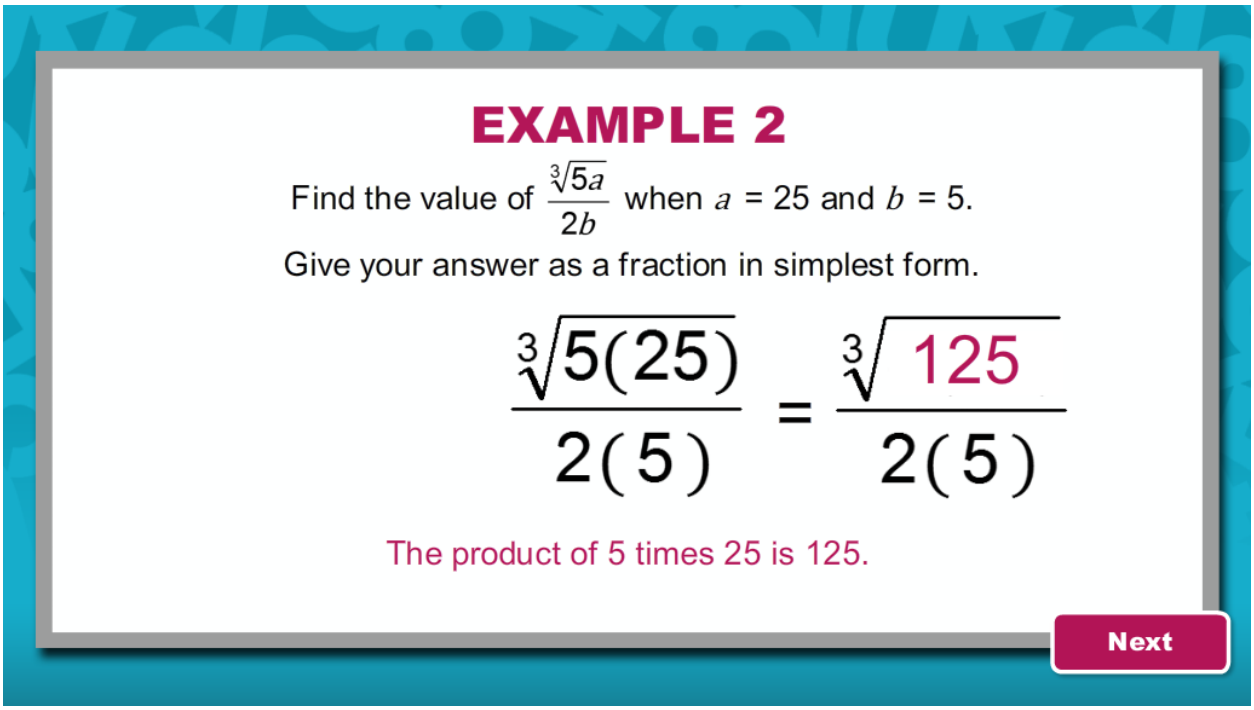
Example 2 (continued)



You may choose to use paper and pencil or the calculator to determine the value of 5(25).

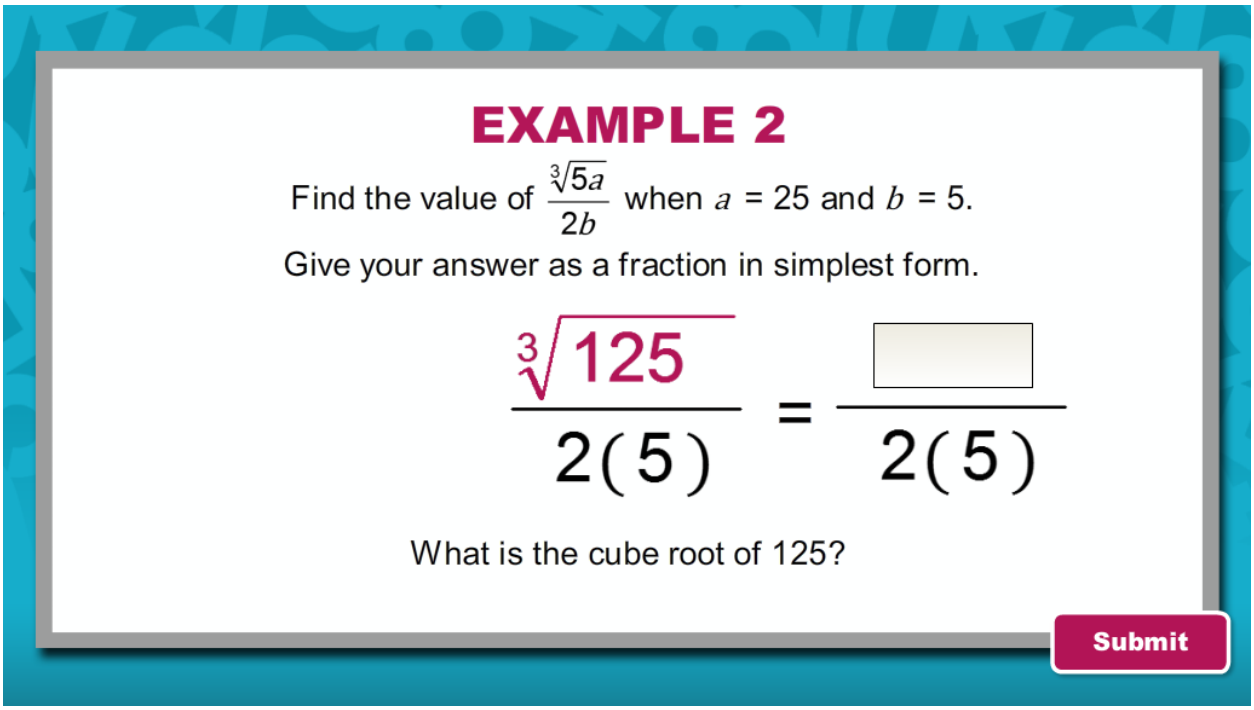
What is the product of 5 times 25?

Example 2 (continued)



Feedback: The product of $5(25) = 125$.

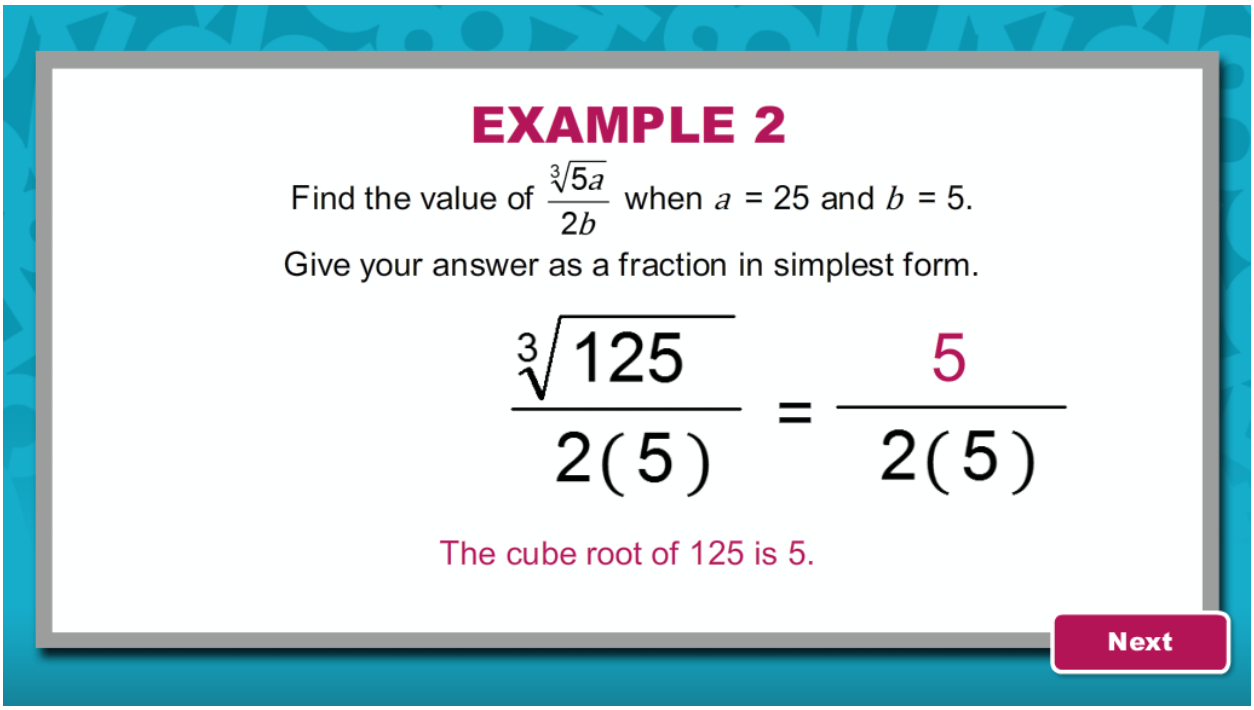
Example 2 (continued)



In the expression, replace 5(25) with 125. In the numerator, you are now left with only one operation to perform. You must take the cube root. You may use paper and pencil to determine $\sqrt[3]{125}$, or you may want to use the cube root function in the calculator.

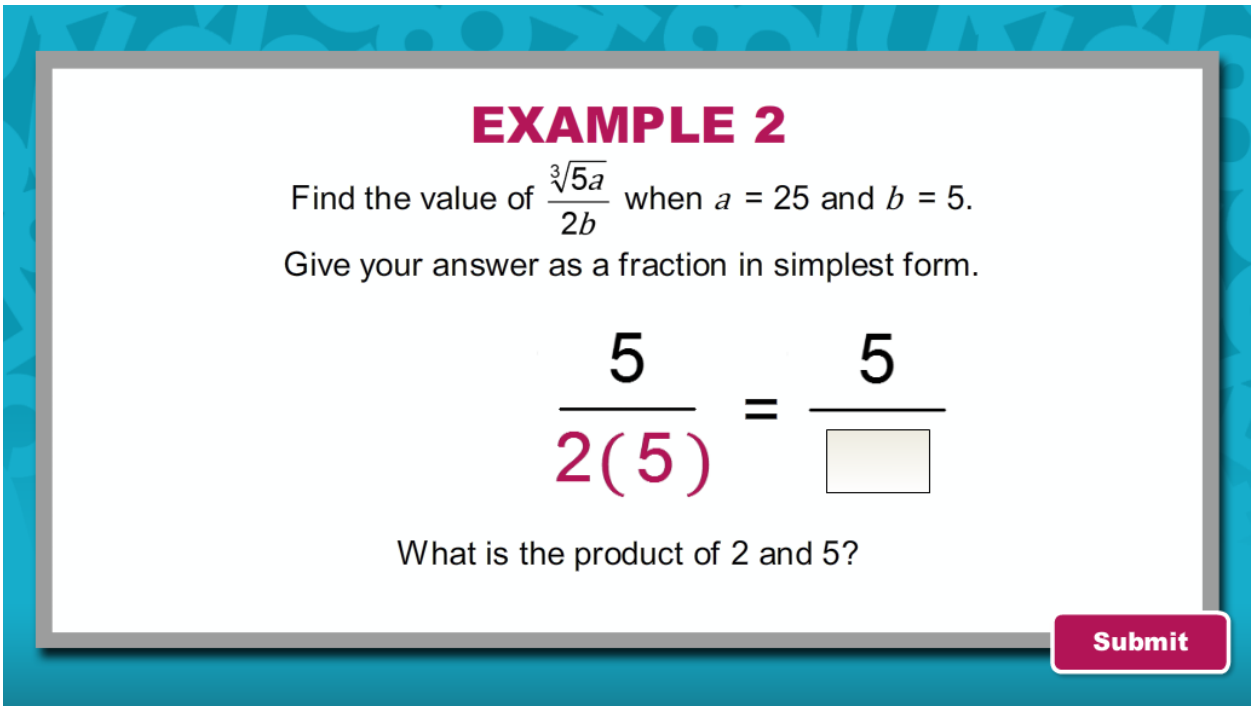
What is the cube root of 125?

Example 2 (continued)



Feedback: $\sqrt[3]{125} = 5$

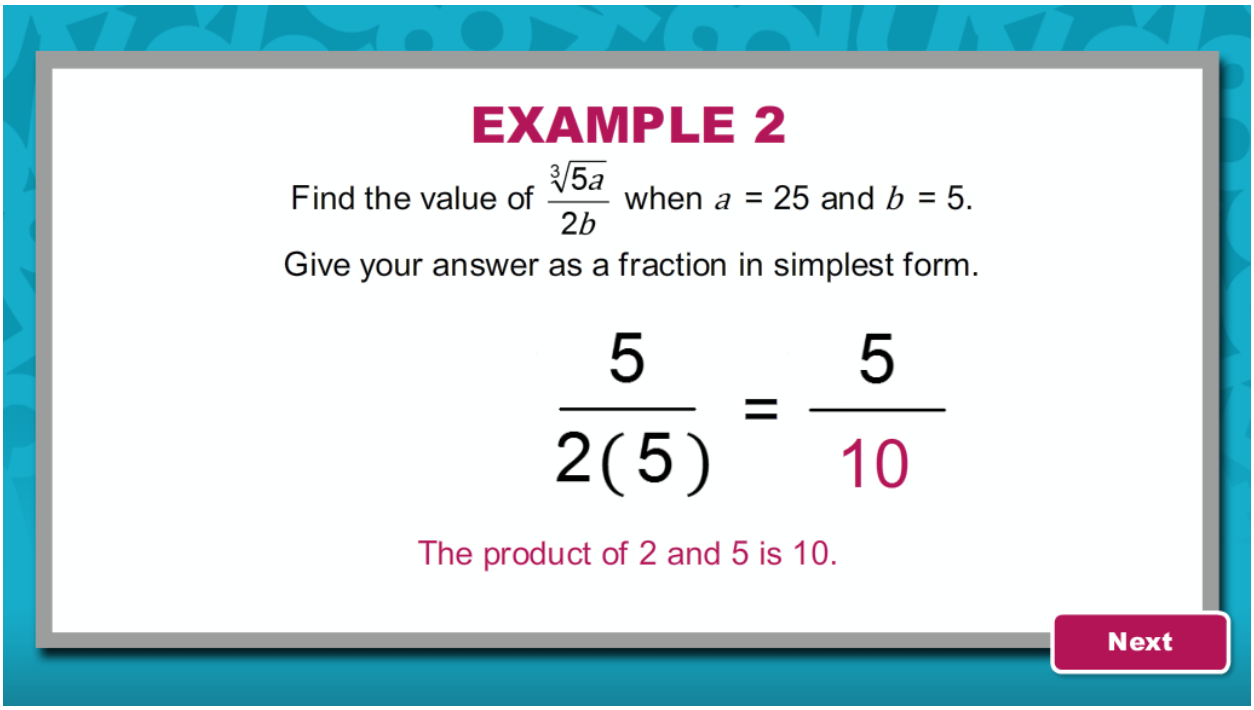
Example 2 (continued)



In the expression replace $\sqrt[3]{125}$ with 5. The numerator is now completely simplified. You can move on to simplify the product in the denominator.

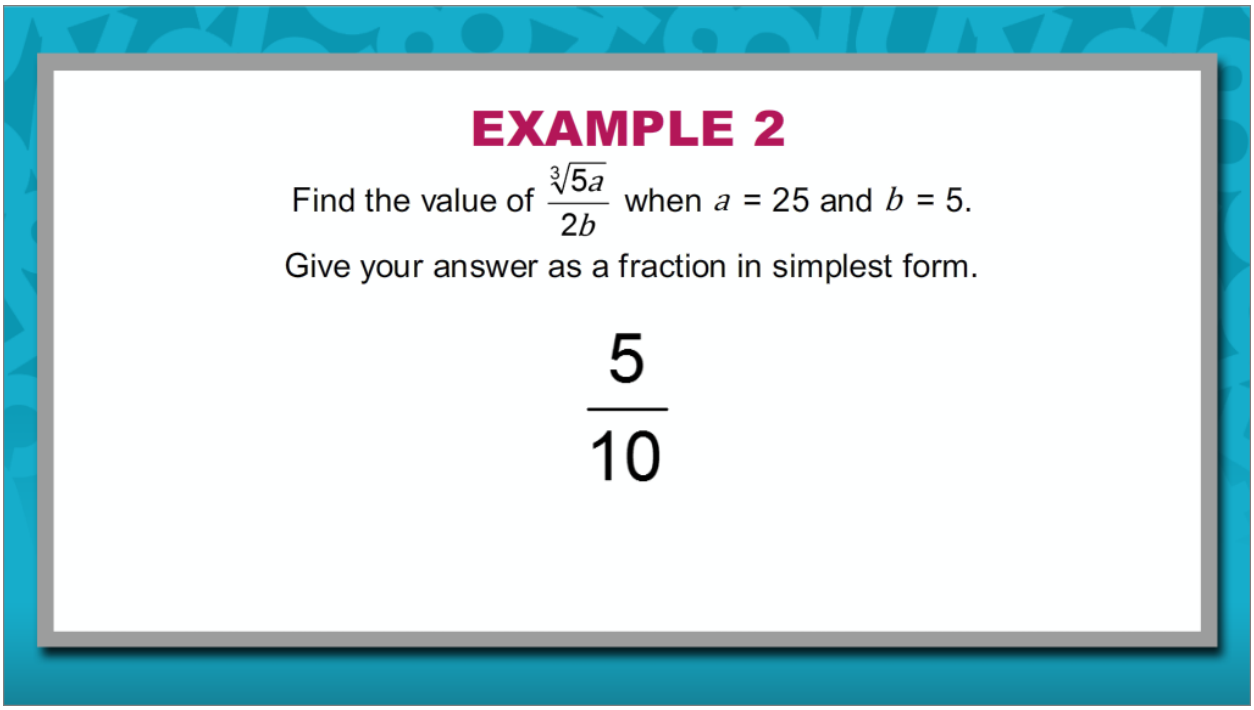
What is the product of 2 and 5?

Example 2 (continued)



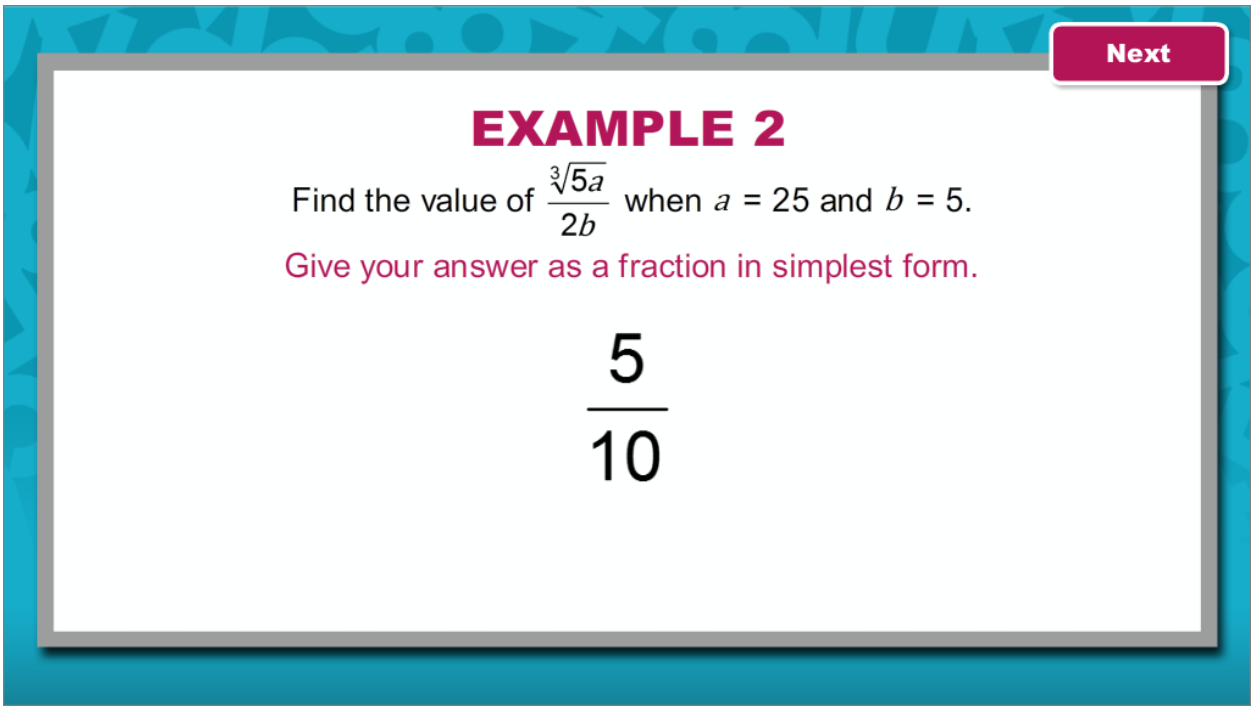
Feedback: $2(5) = 10$.

Example 2 (continued)



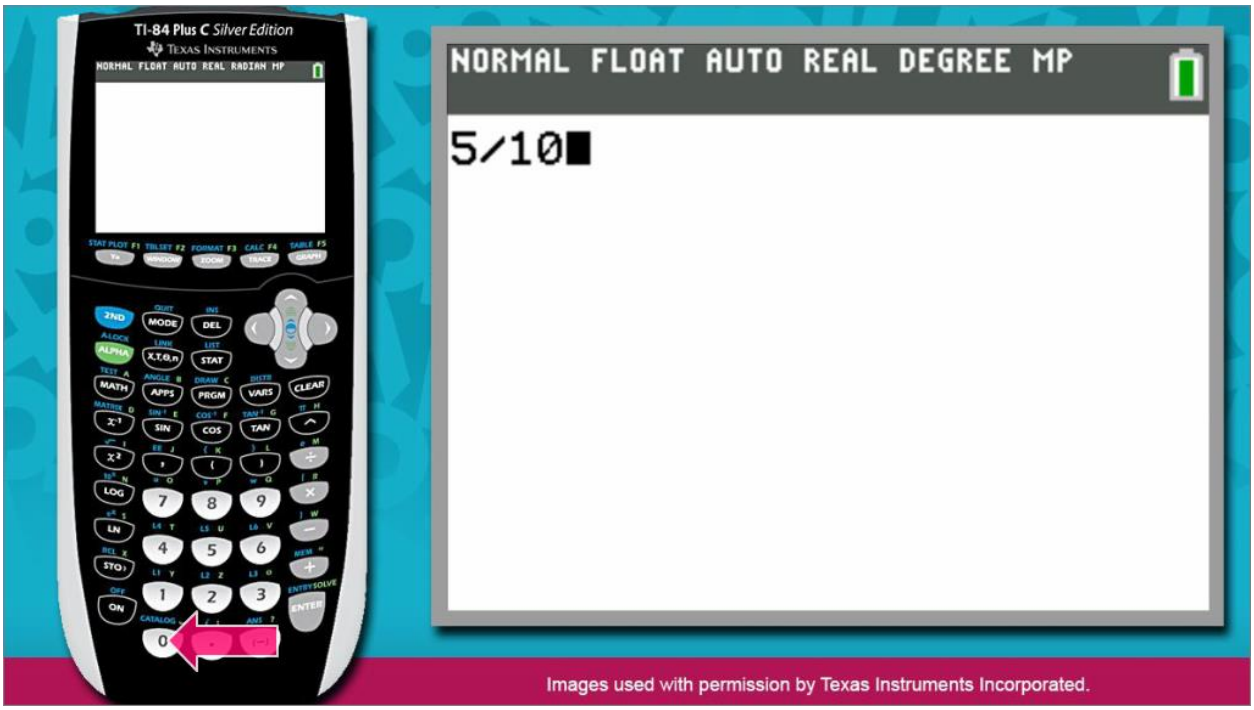
In the expression, replace 2(5) with10. Now the expressions in both the numerator and denominator are simplified.

Example 2 (continued)



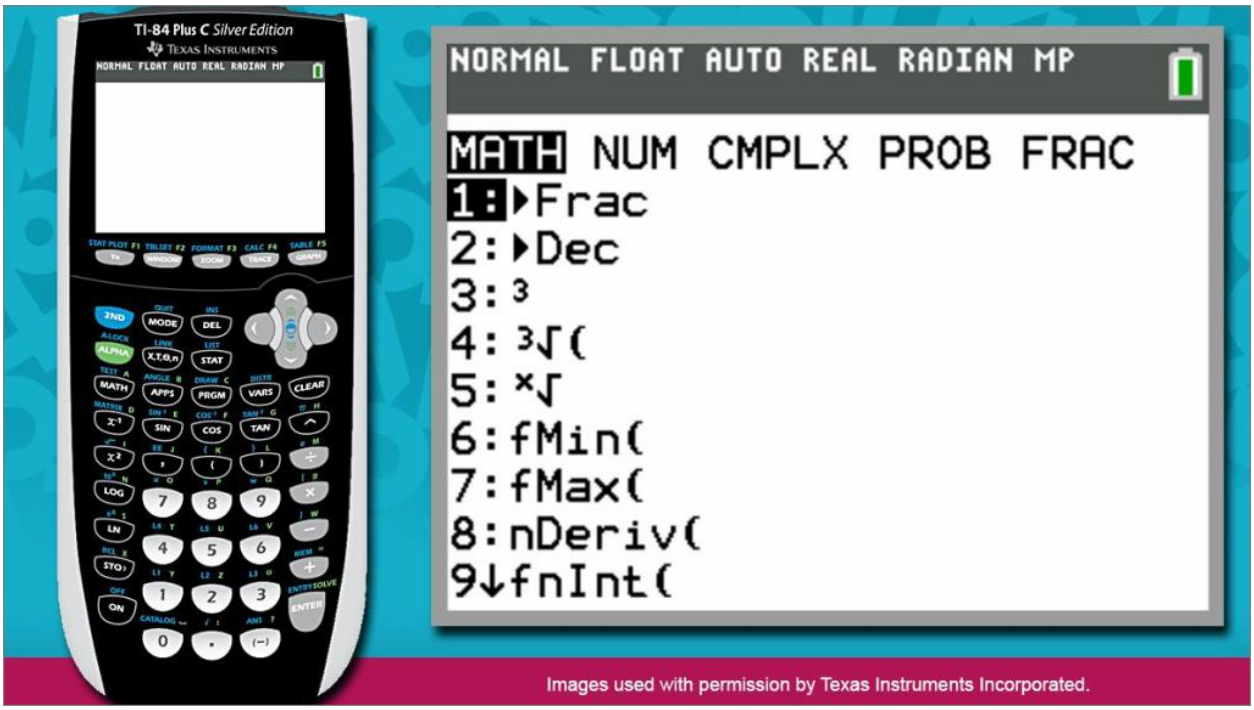
In this example you are asked to give your answer as a fraction in simplest form. You may choose to use mental math to simplify $\frac{5}{10}$, or you may want to use one of the functions in the calculator.

Example 2 (continued)



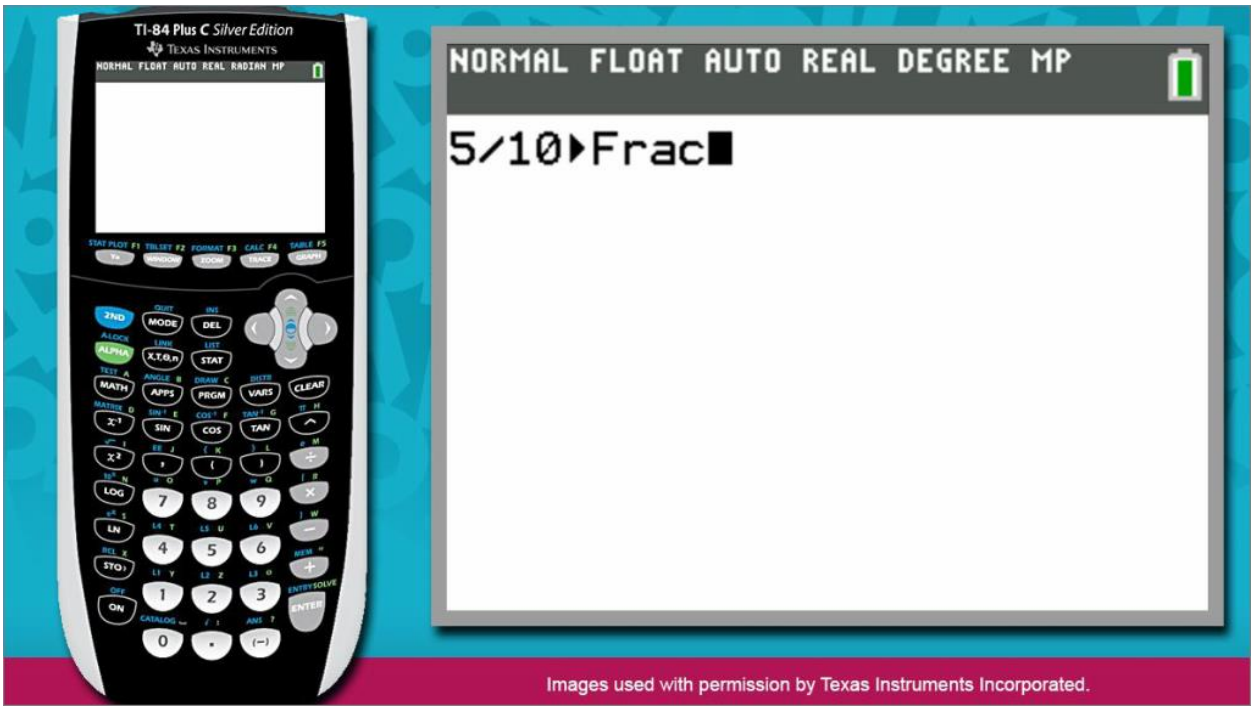
Remember that a fraction is essentially a division problem. So begin by pressing 5, then the division key, then 1, then 0.

Example 2 (continued)



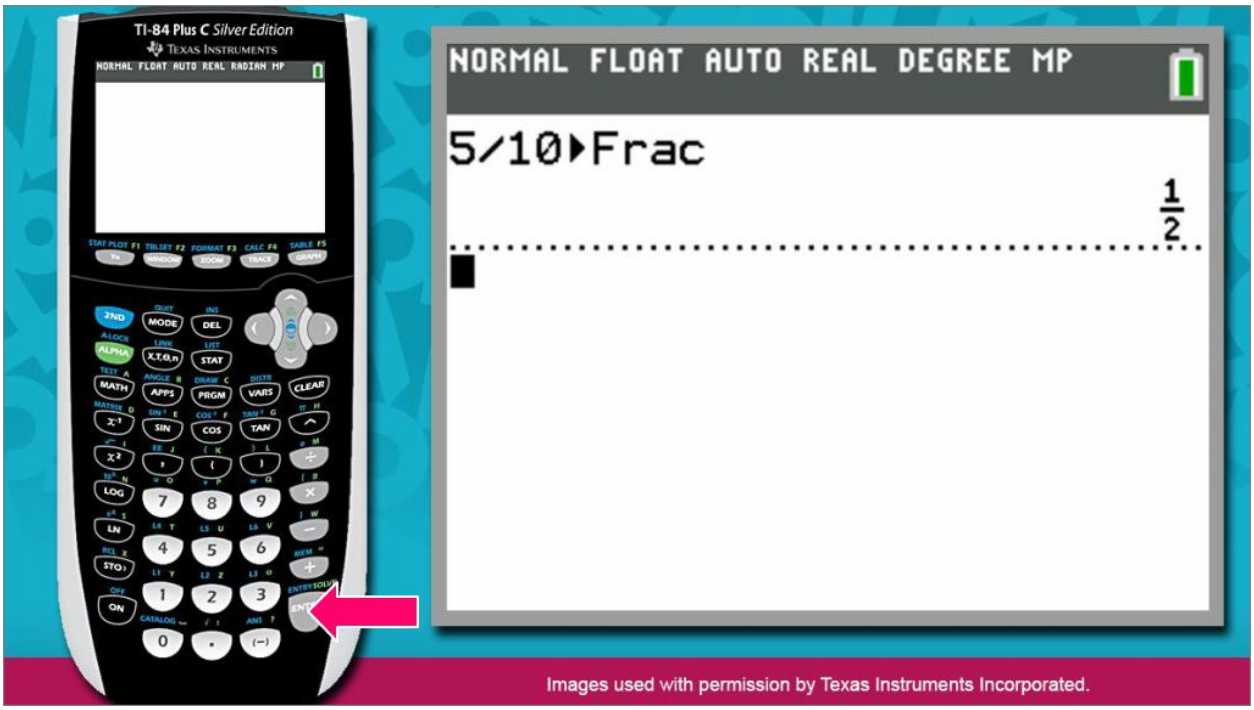
Now it's time to inform the calculator that you would like the quotient expressed as a fraction in simplest form. Press the MATH key. Press 1 to choose the first option.

Example 2 (continued)



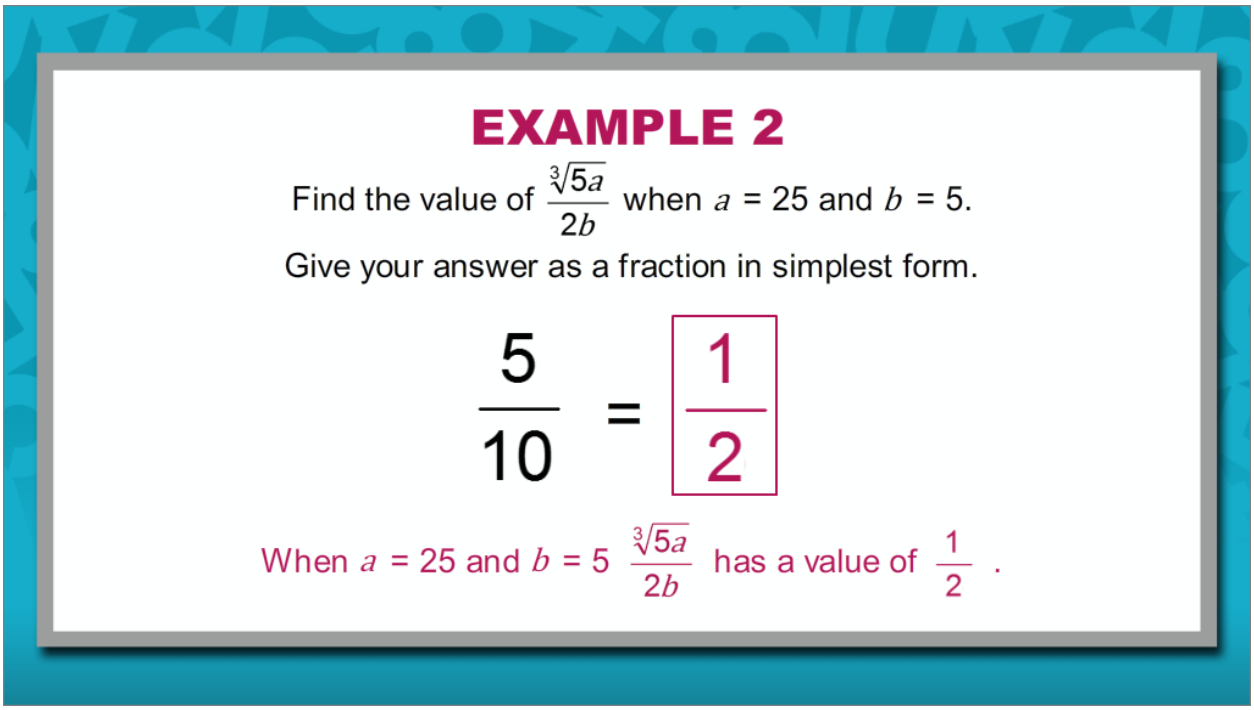
You will notice the calculator return to the home screen. Immediately following your expression is a function that will alert your calculator to give an answer as a fraction in simplest form.

Example 2 (continued)



Press enter. The quotient of 5 and 10, given as a fraction in simplest form, is $\frac{1}{2}$.

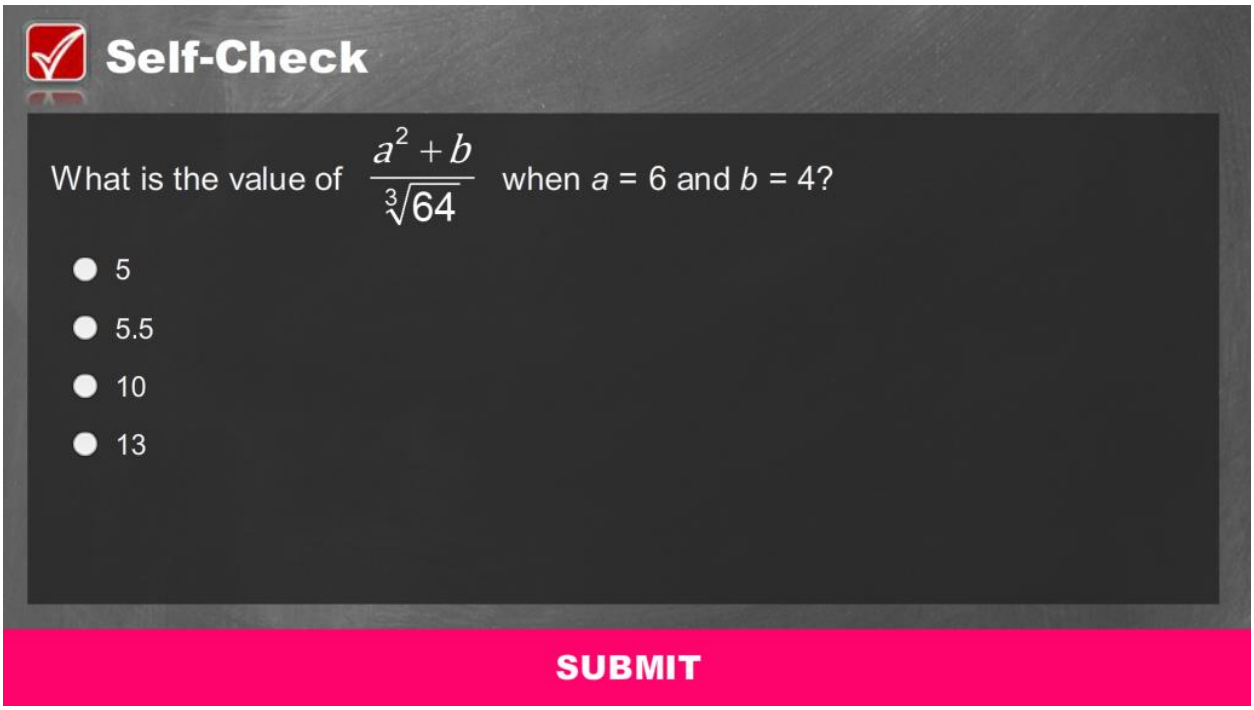
Example 2 (continued)



Your work is complete.

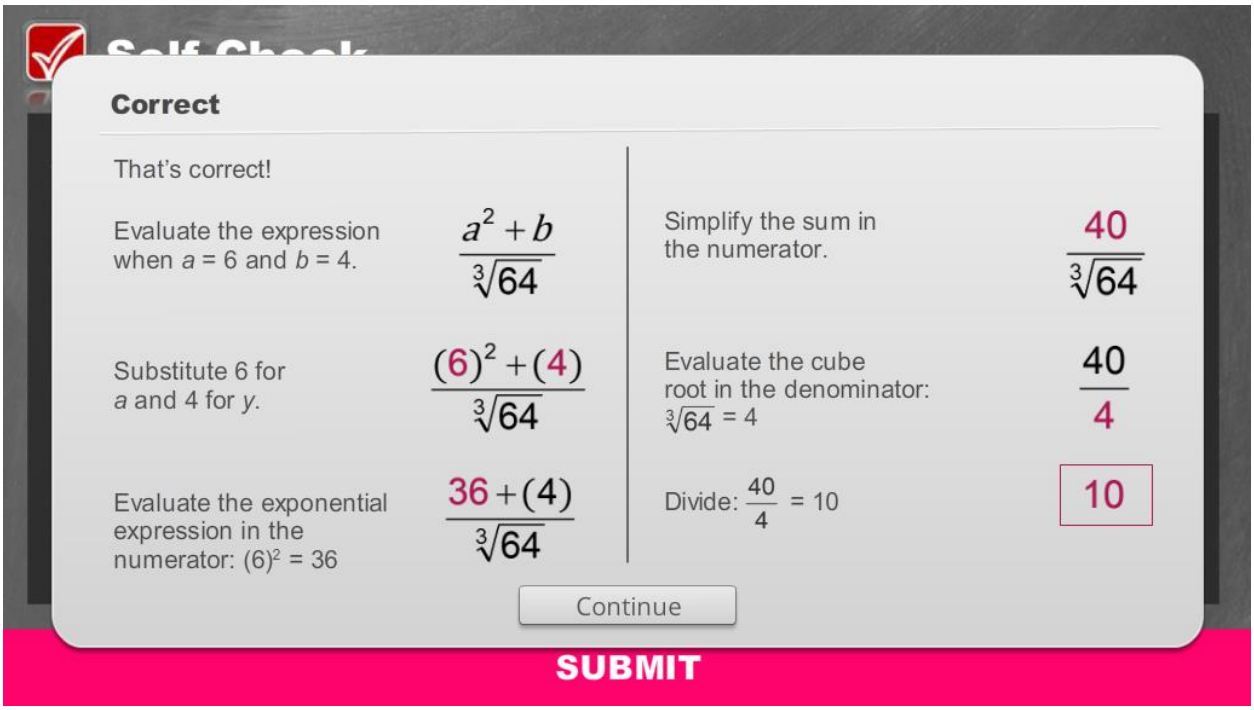
When $a = 25$ and $b = 5$, $\frac{\sqrt[3]{5a}}{2b}$ has a value of $\frac{1}{2}$.

Self-Check



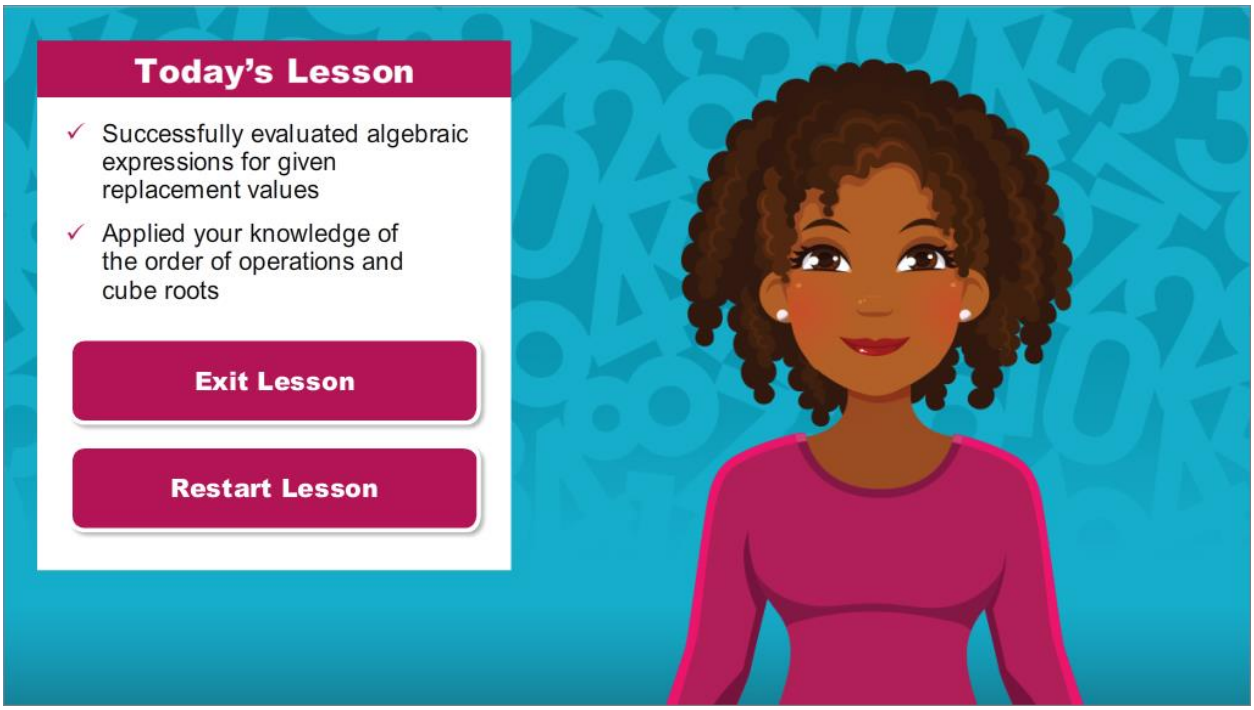
Solve the problem in the image above to check your understanding of the content.

Self-Check: Answer



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

Conclusion



Congratulations! You have reached the conclusion of this lesson in Algebra I. You have applied your knowledge of the order of operations and cube roots to evaluate algebraic expressions for given replacement values.