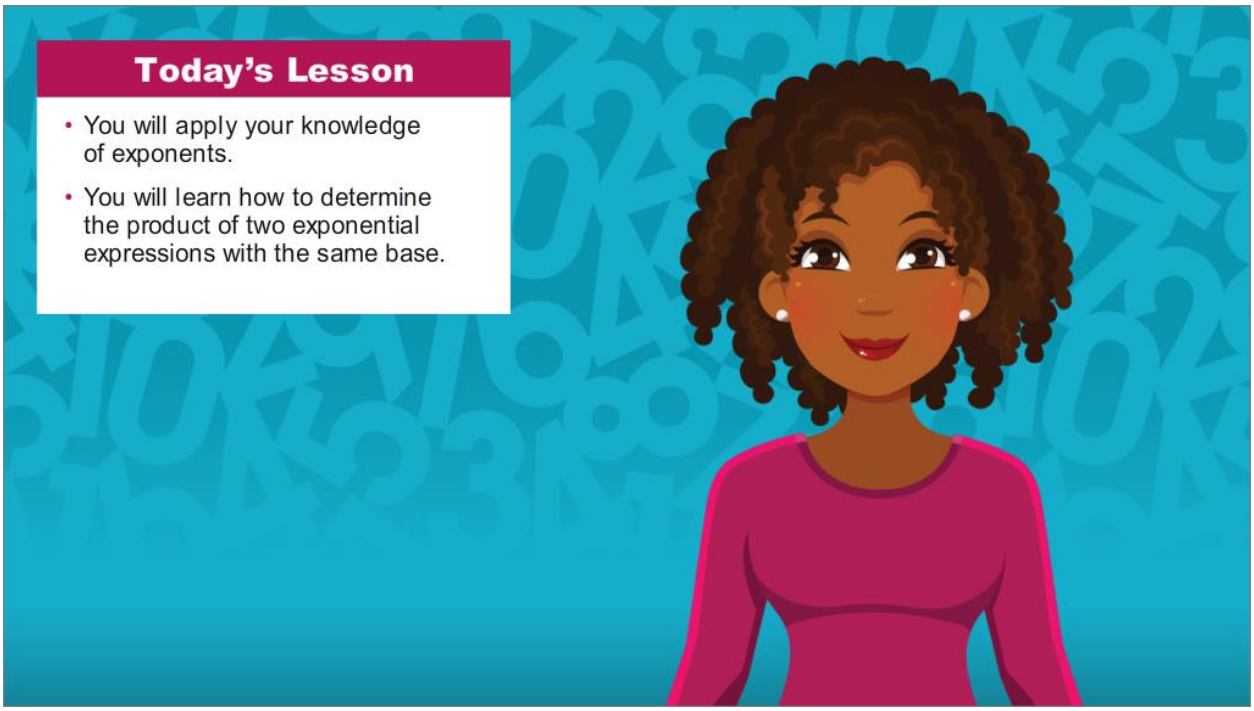
Module 2: Properties of Exponents
Topic 1: Product of Powers

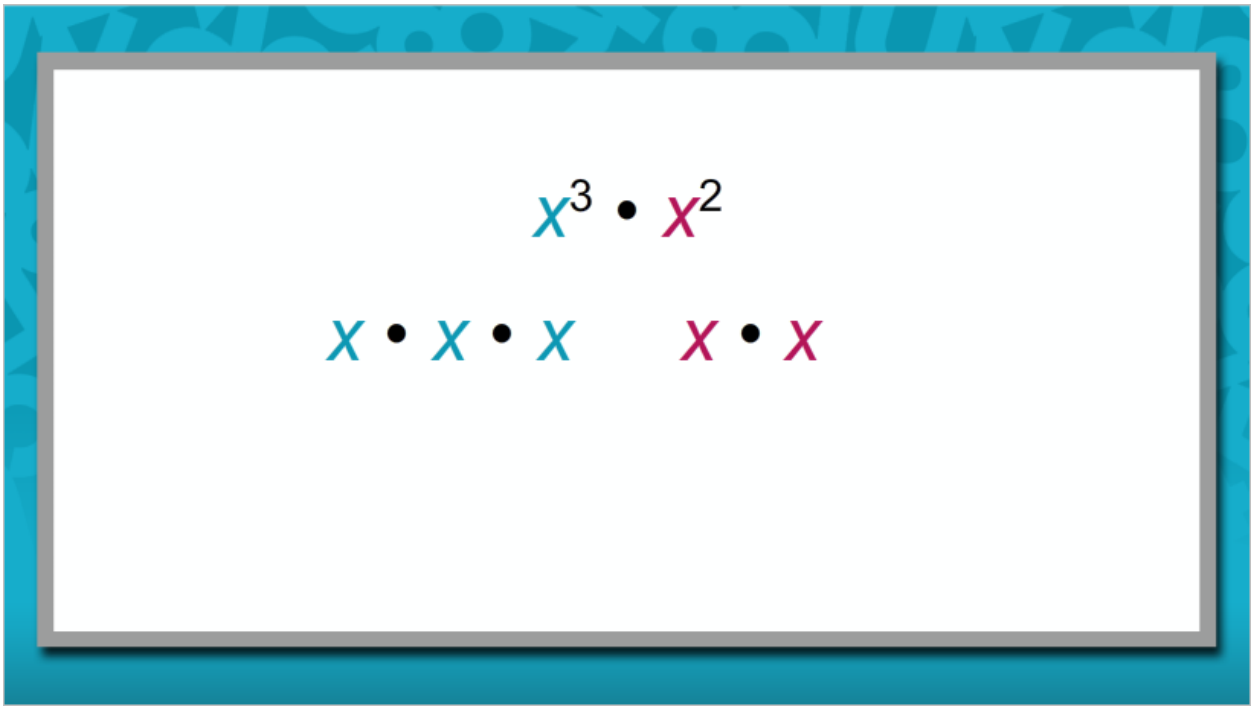
Introduction



Hi there! I'm so glad you could join me for this lesson in Algebra I. Before you dive into this lesson, take a moment to think back to some of your earlier math studies. Do you recall simplifying expressions that included exponents? In this lesson, you will apply your knowledge of exponents and discover a rule that allows you to easily determine the product of two exponential expressions that have the same base. Let's begin!

Module 2: Properties of Exponents
Topic 1: Product of Powers

Product of Powers Property

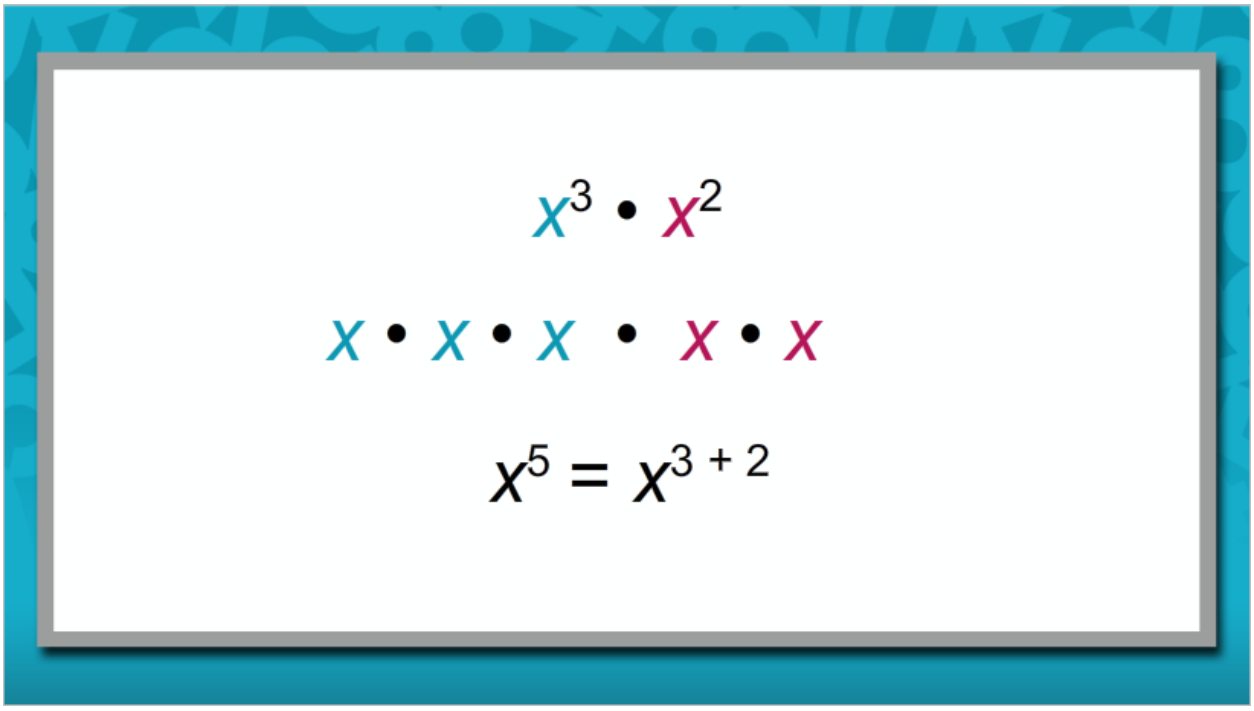


Consider the product of x cubed and x squared.

x cubed, when expanded, is x times x times x.

x squared, when expanded, is x times x.

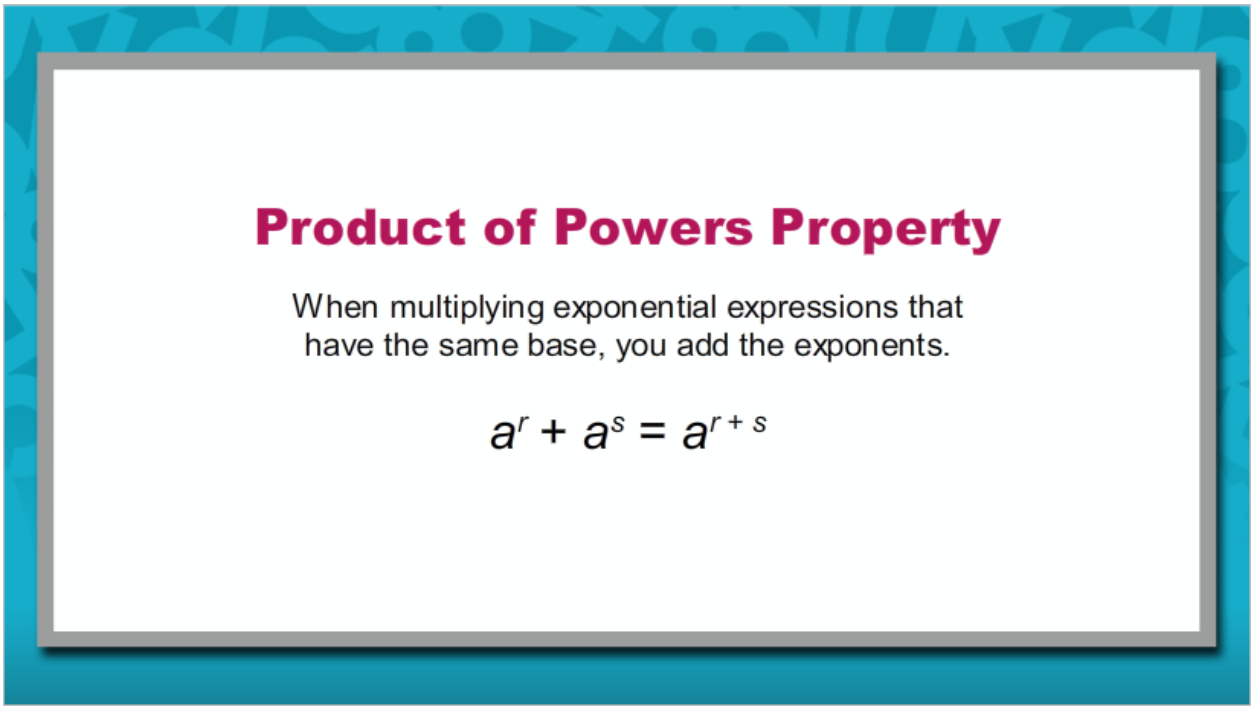
Product of Powers Property (continued)



So, x cubed times x squared equals the product of 5 x's, or in other words, x^5.

The exponent in the result is the sum of the exponents in the product.

Product of Powers Property (continued)

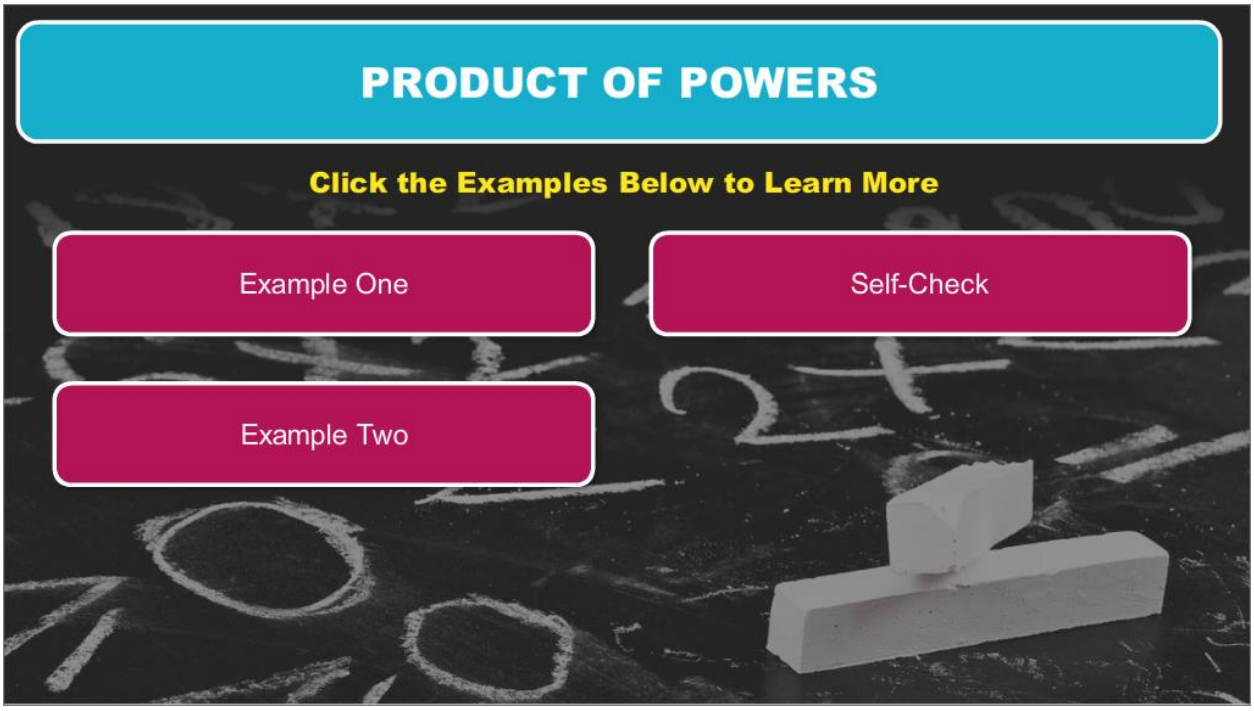


This example shows the pattern that appears when multiplying exponential expressions that have the same base; you add the exponents. This is known as the Product of Powers Property.

$$a^r \cdot a^s = a^{r+s}$$

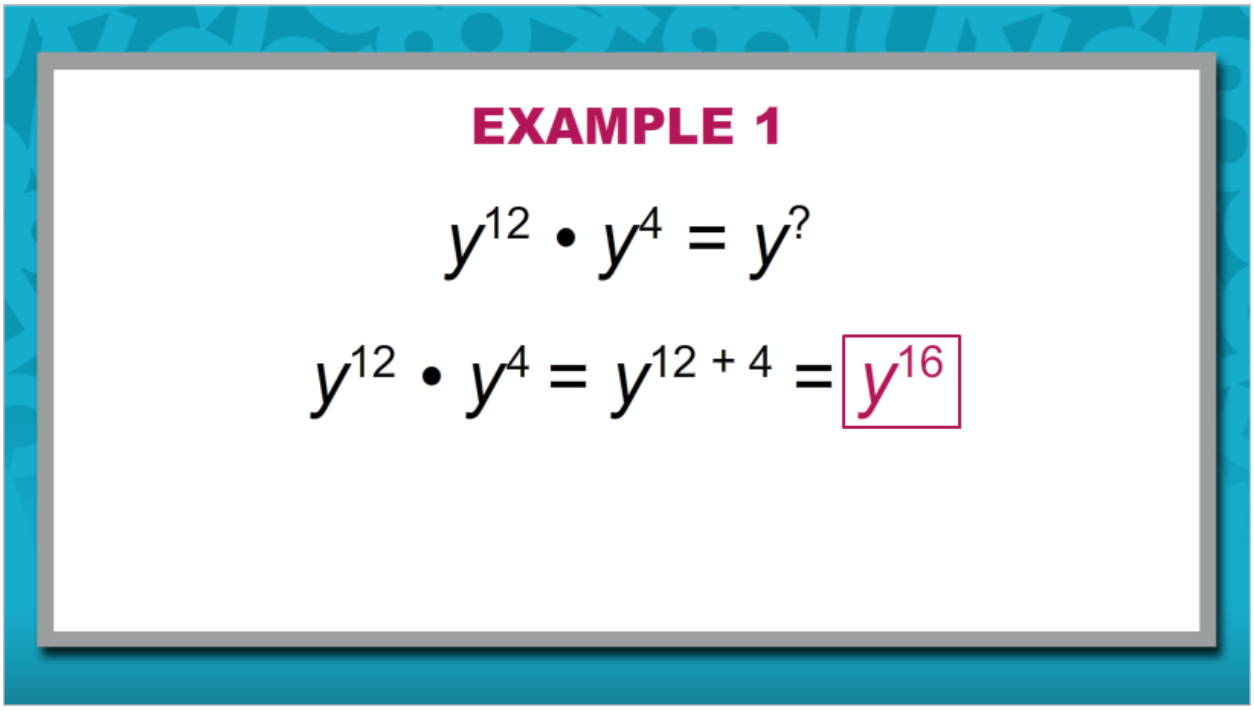
Module 2: Properties of Exponents
Topic 1: Product of Powers

Product of Powers



Click the examples below to learn more.

Example 1

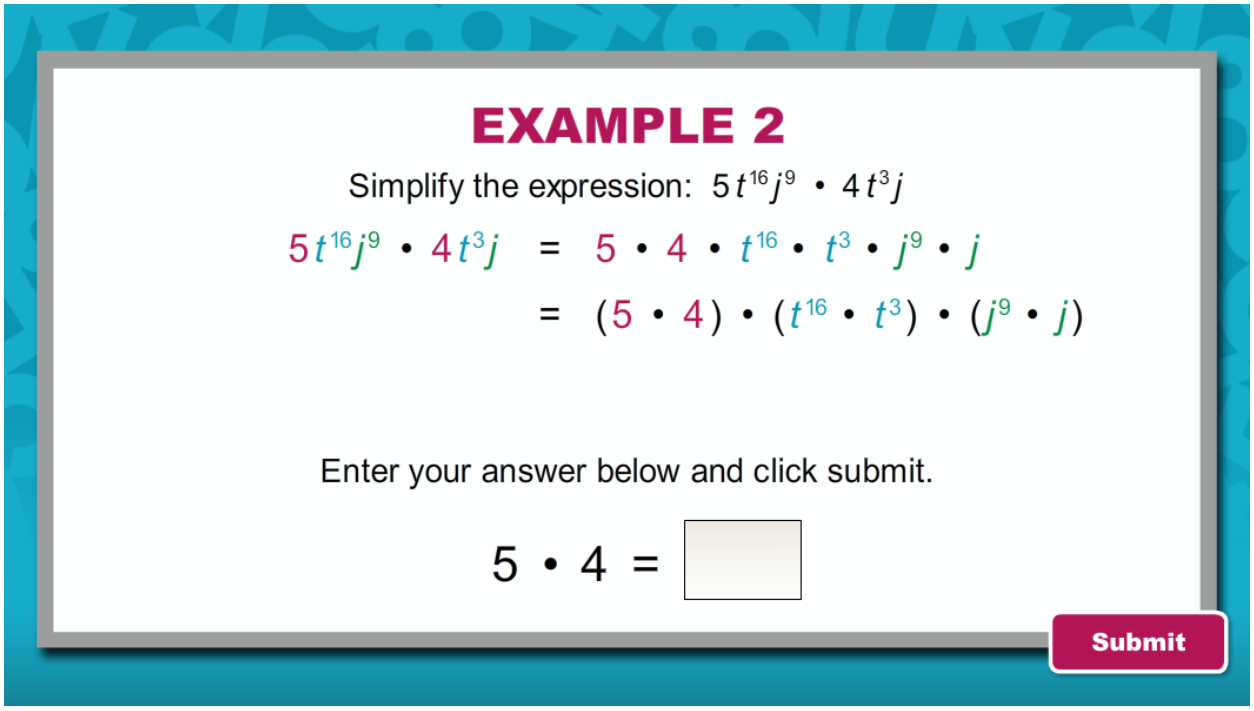


$y^{12} \cdot y^4 = y^?$

In this example, you are asked to find the product of y^{12} and y^4. Because each of the expressions have the same base, you will simply need to add the exponents.

Therefore, $y^{12} \cdot y^4 = y^{16}$.

Example 2



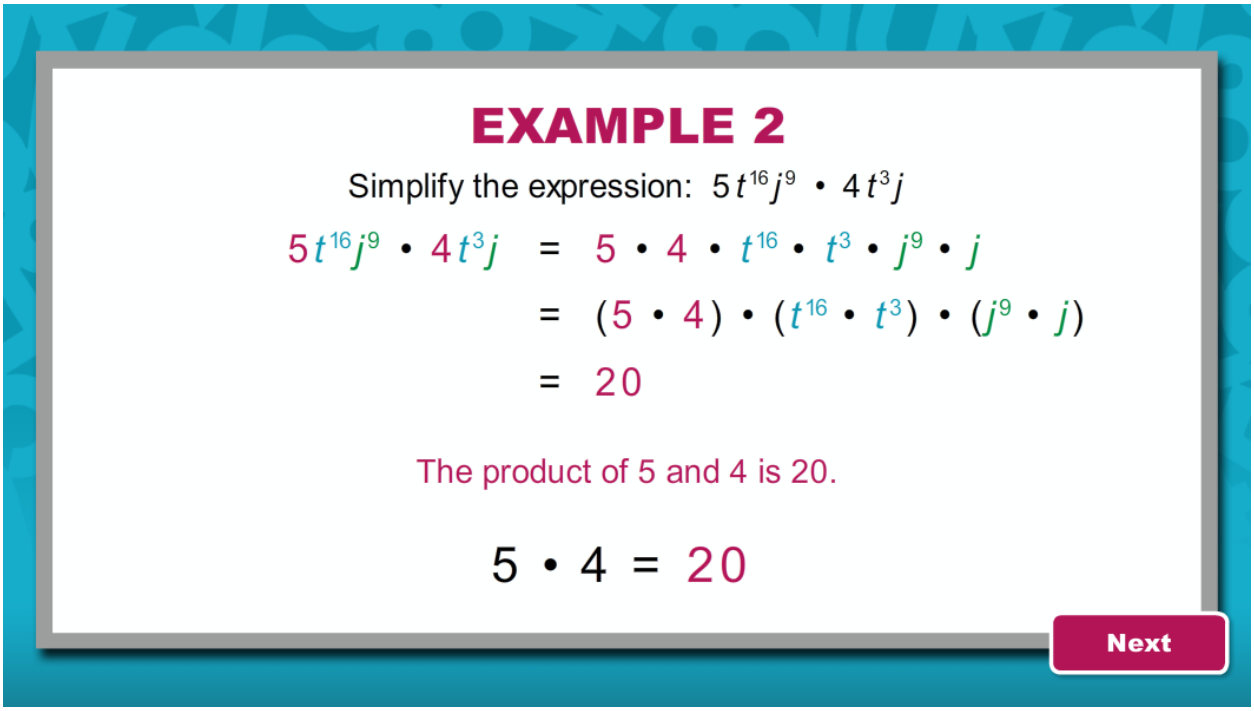
Simplify the expression: $5t^{16}j^9 \cdot 4t^3j$

In this example, you must find the product of exponential expressions that include coefficients and more than one base. Recall that the Commutative Property of Multiplication states that you can multiply values in any order. Apply that property in this example by changing the order of multiplication, so that you multiply the coefficients first, then t^{16} and t^3, and lastly, j^9 and j.

$5 \cdot 4 = ?$

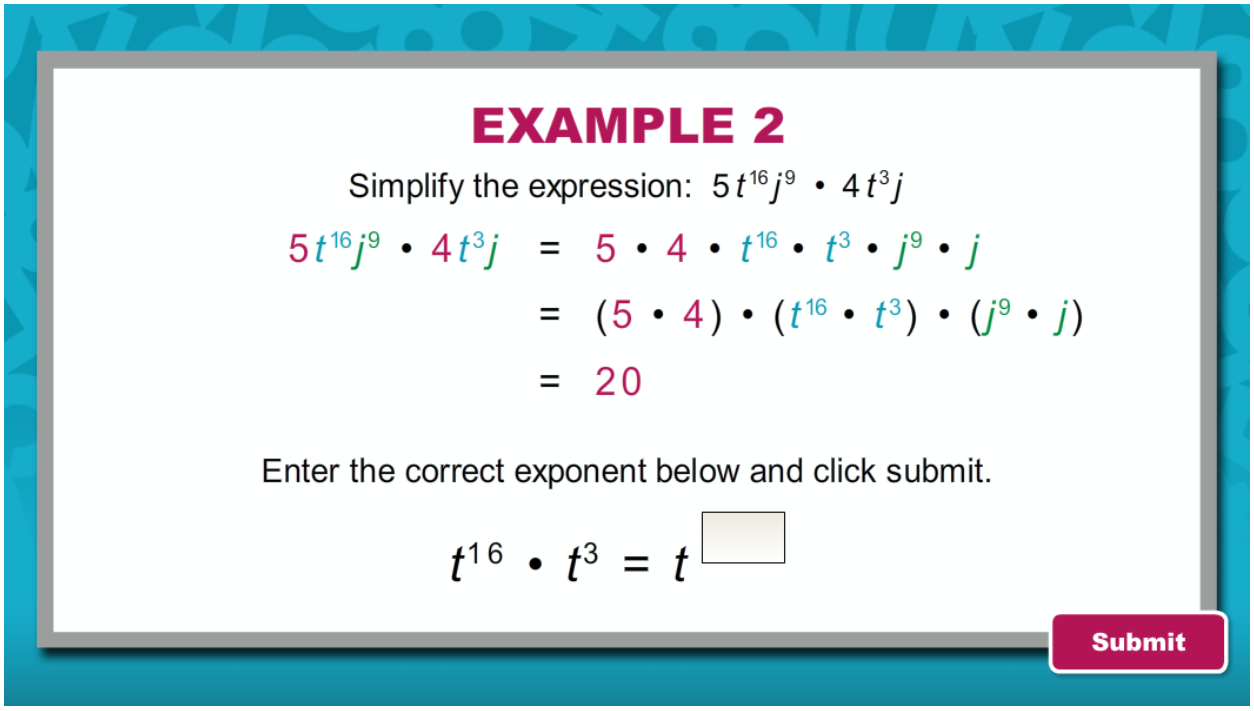
Enter your answer below and click submit.

Example 2 (continued)



Feedback: $5 \cdot 4 = 20$

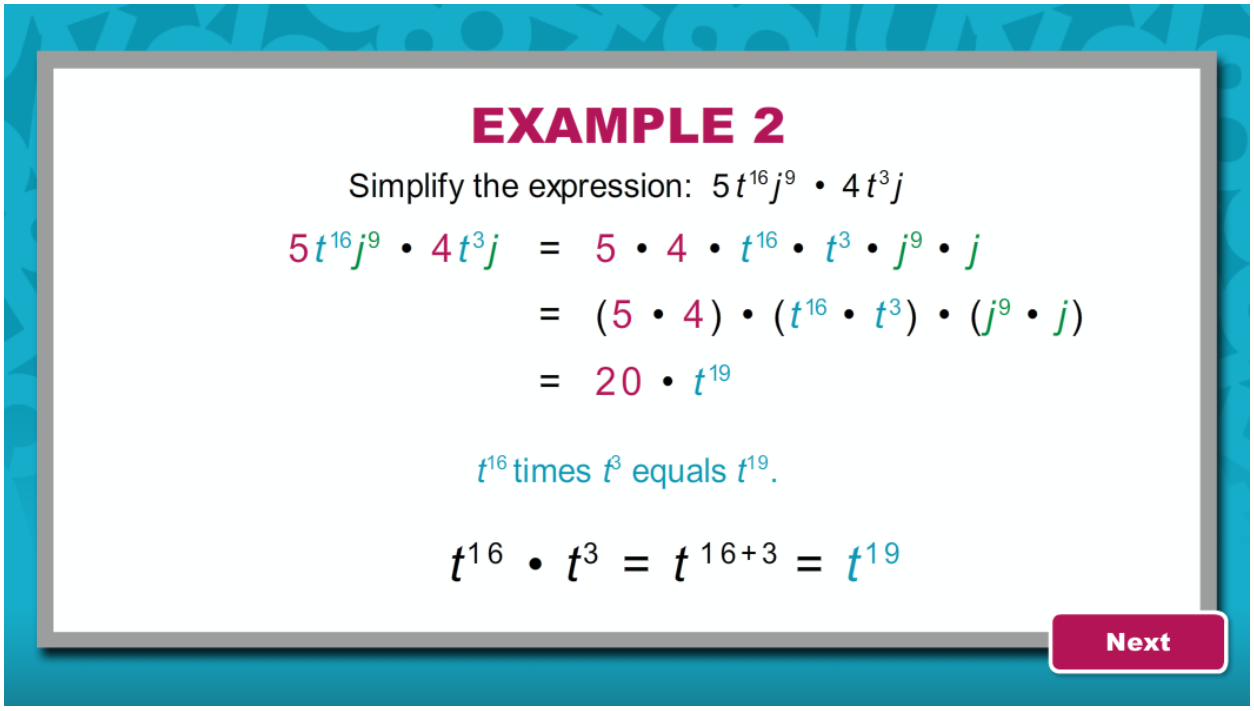
Example 2 (continued)



In order to multiply t^{16} and t^3, you will need to add the exponents.

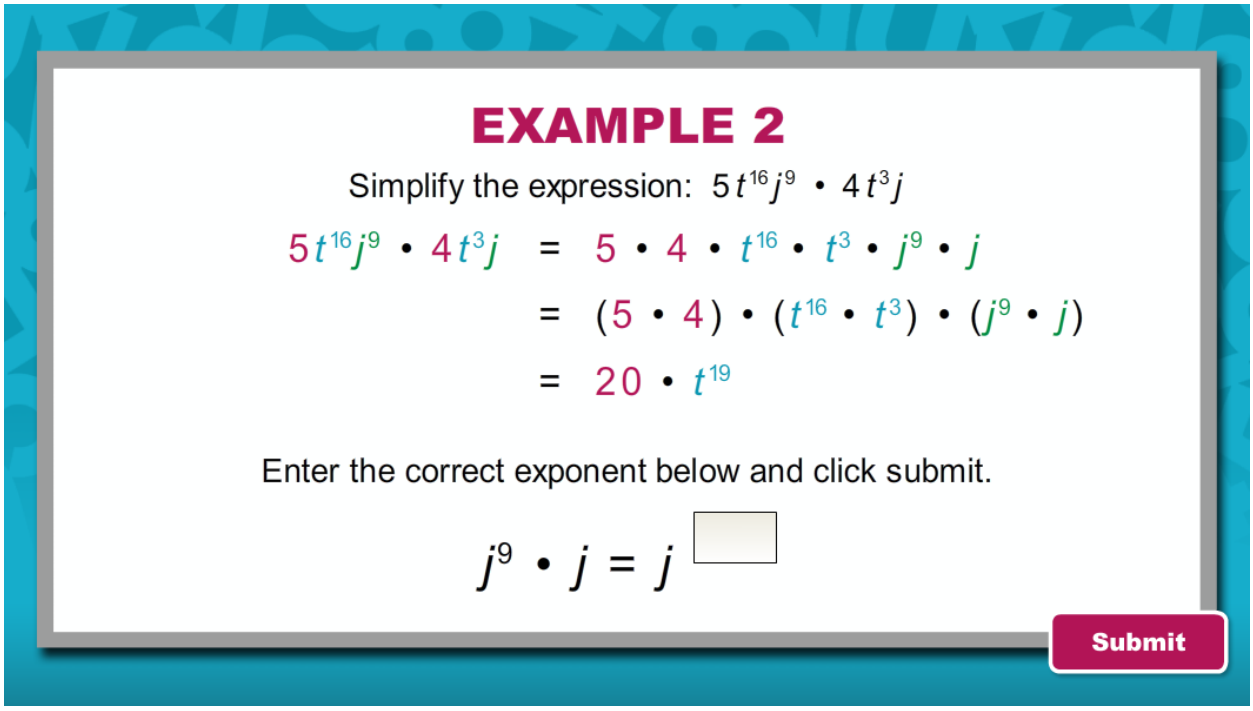
$t^{16} \cdot t^3 = t^{?}$

Example 2 (continued)



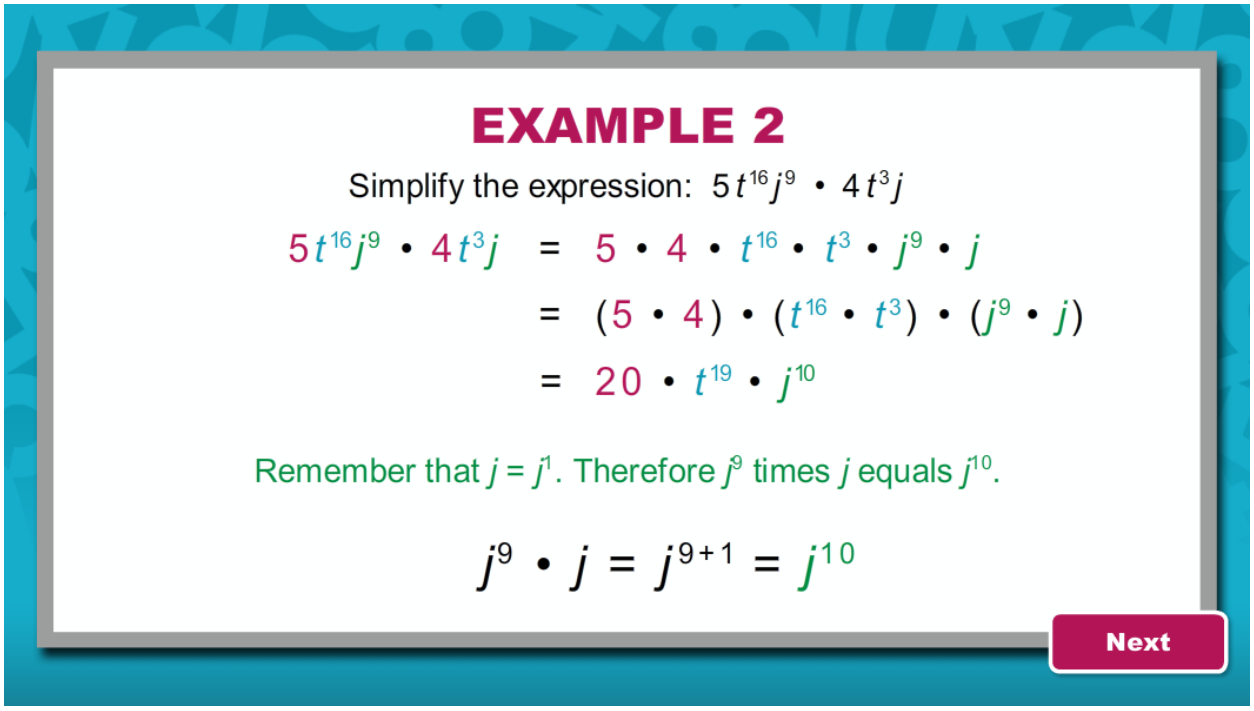
Feedback: $t^{16} \cdot t^3 = t^{16+3} = t^{19}$

Example 2 (continued)



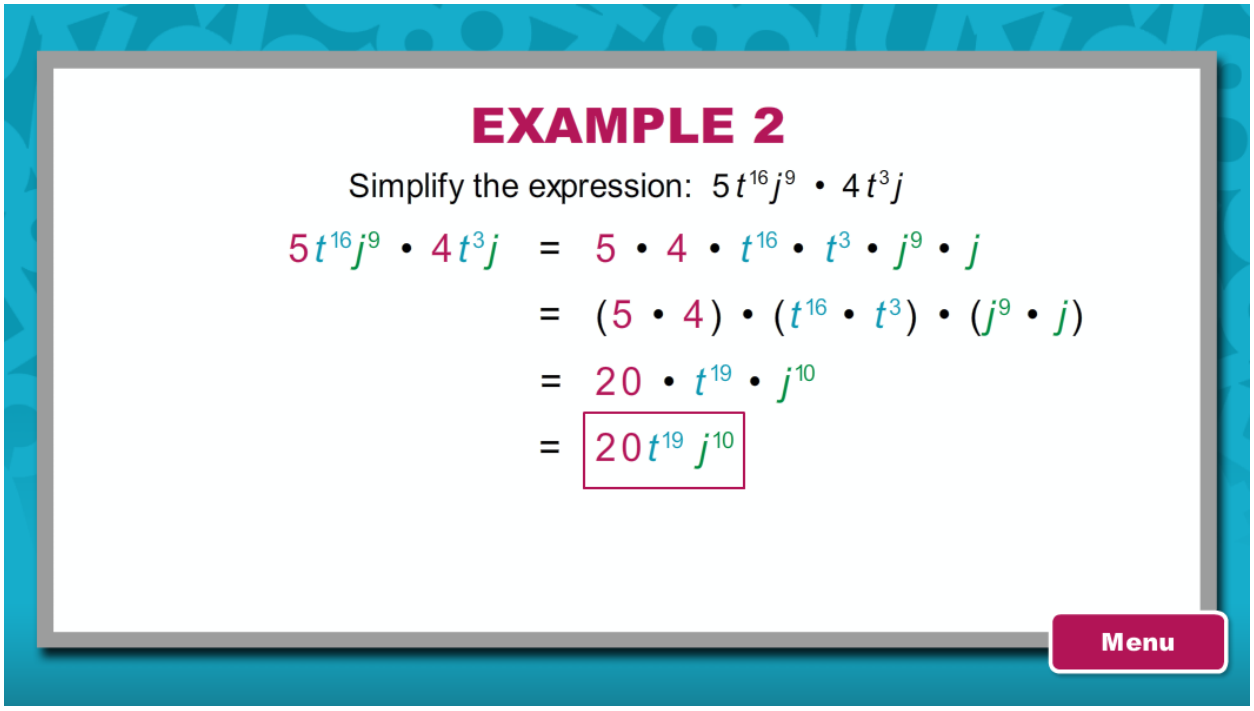
In order to multiply j^9 and j, you will need to add the exponents.

Example 2 (continued)



Feedback: Remember, $j = j^1$.

Example 2 (continued)



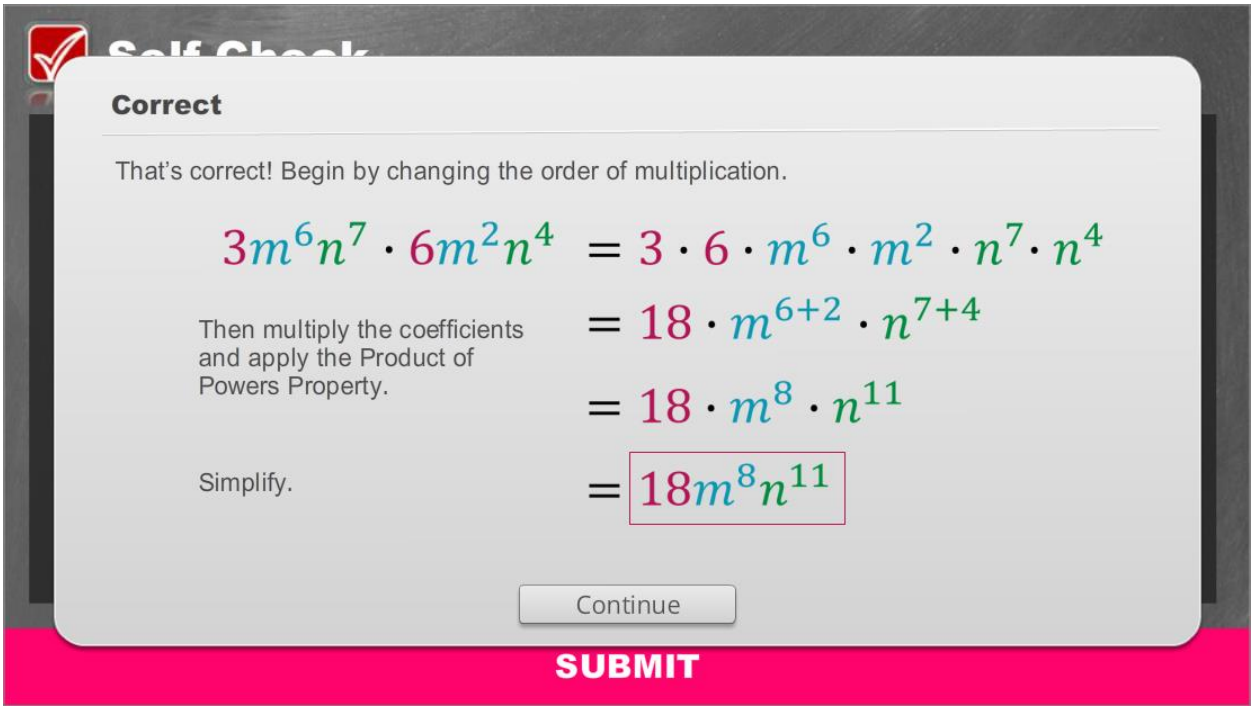
Now that you have determined the product of the coefficients and the exponential portions, simplify the expression.

Your work is complete. The final answer is $20t^{19}j^{10}$.

Self-Check

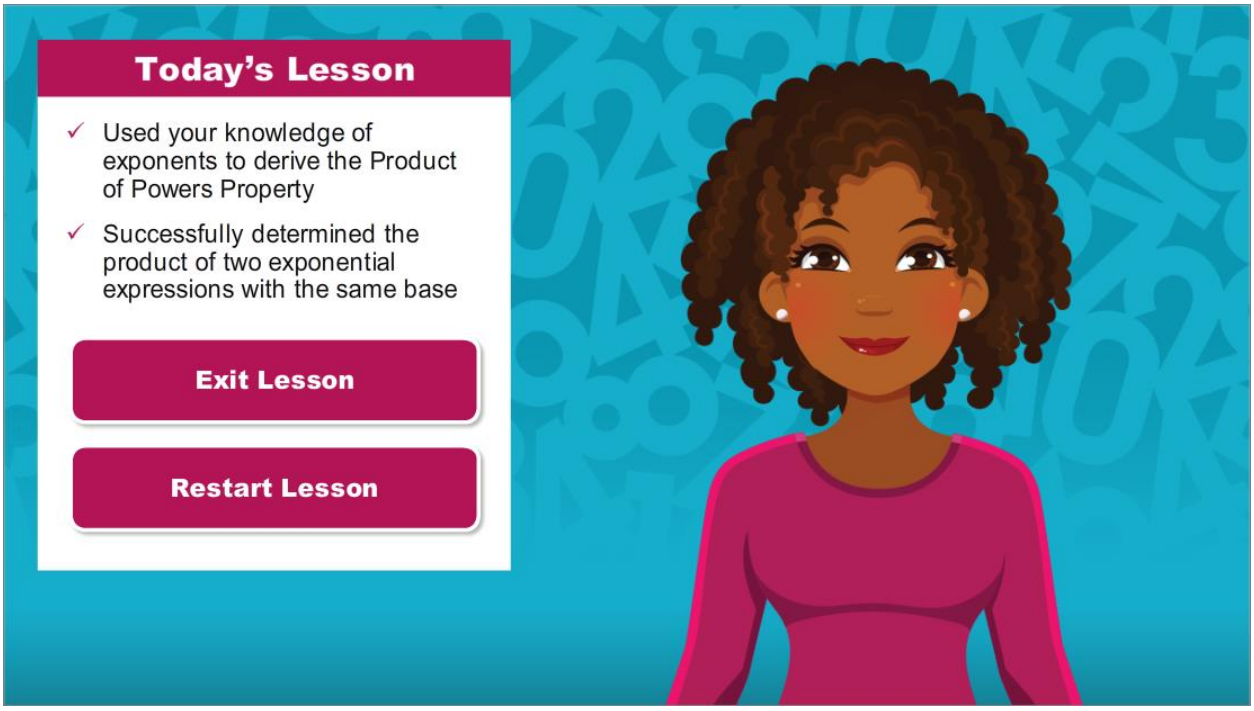
Solve the problem in the image above to check your understanding of the content.

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. In this lesson, you used your knowledge of exponents to derive the Product of Powers Property, which allowed you to easily determine the product of two exponential expressions that have the same base.