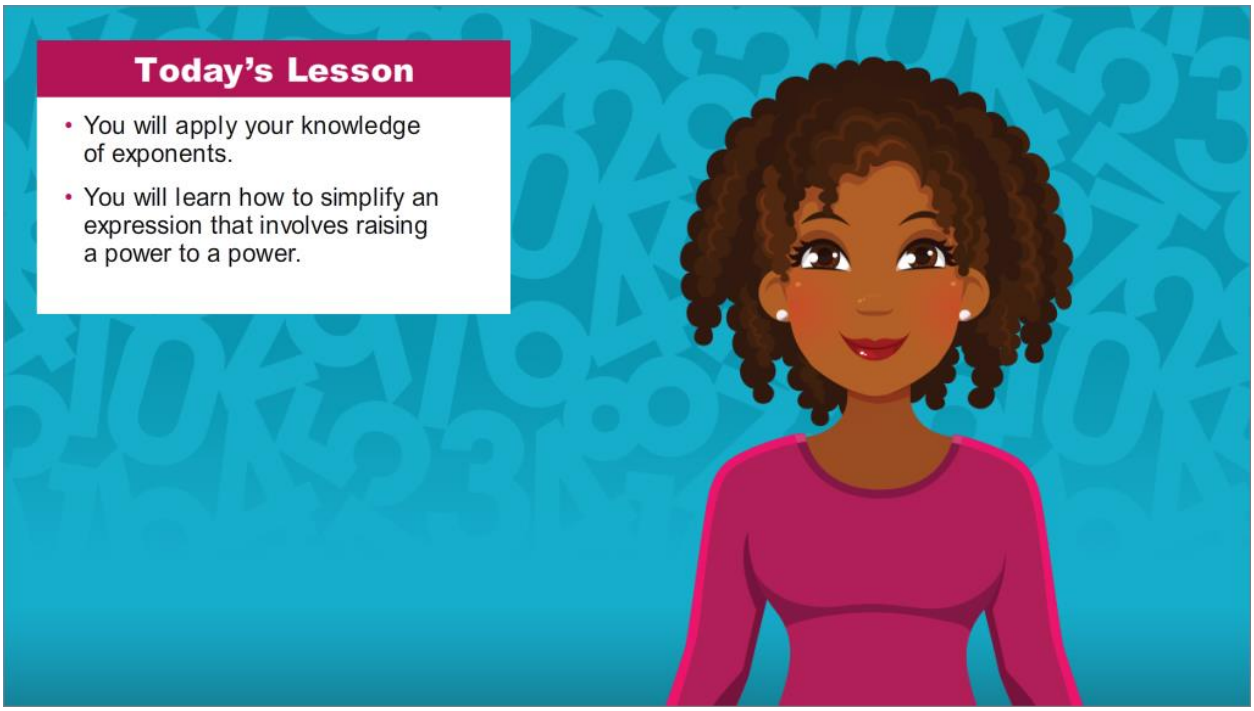
Module 2: Properties of Exponents
Topic 1: Power of a Power

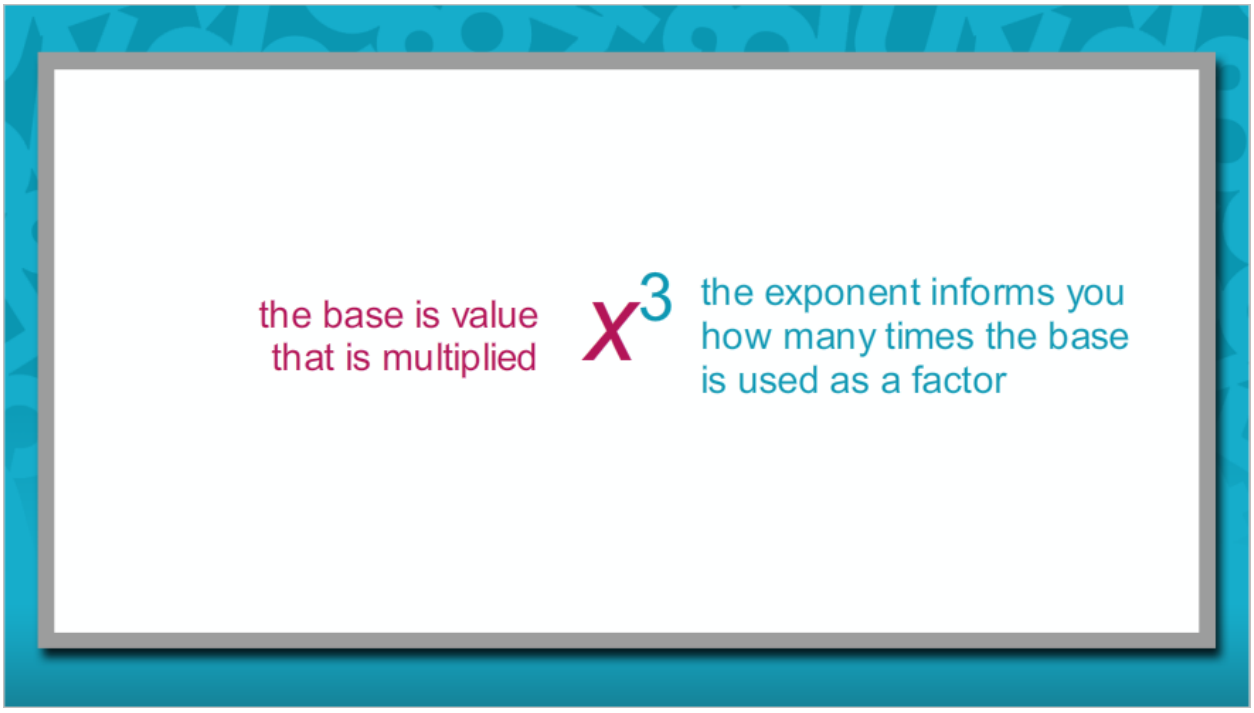
Introduction



Hello and welcome! In your earlier math studies, you have simplified expressions involving exponents. In this lesson, you will apply this knowledge to discover a rule that allows you to easily simplify an expression that involves raising a power to a power.

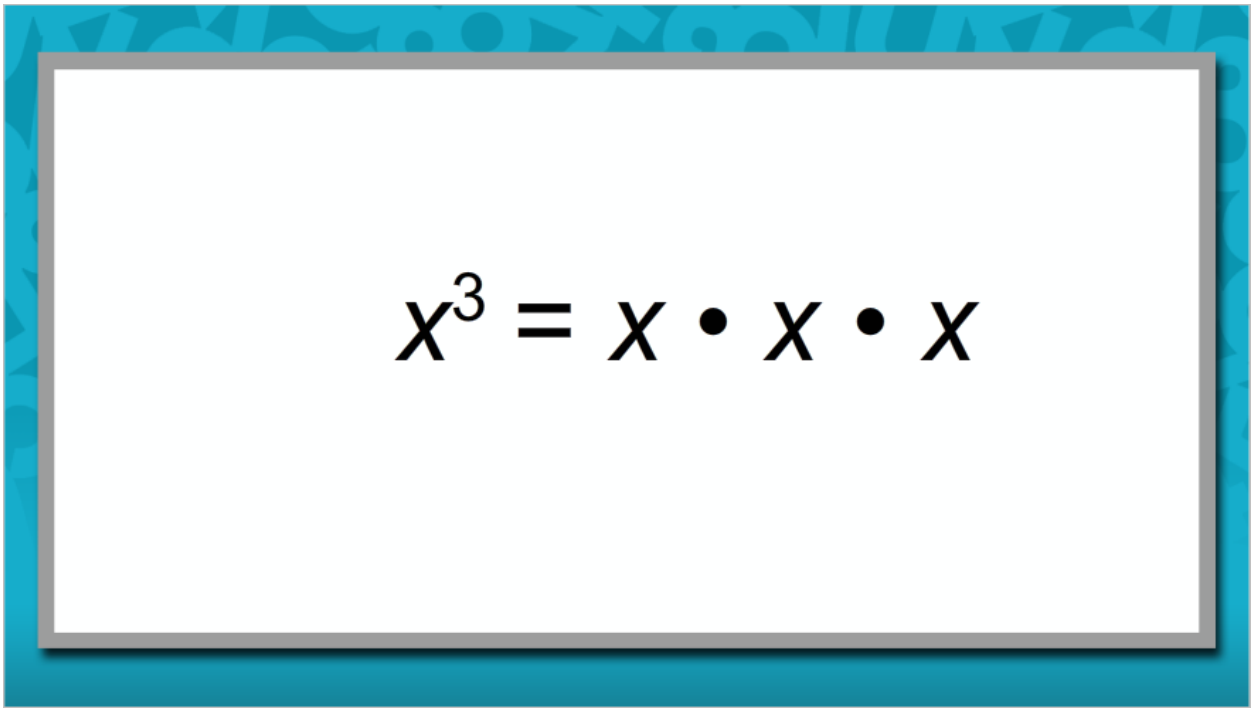
Module 2: Properties of Exponents
Topic 1: Power of a Power

Power of a Power Property



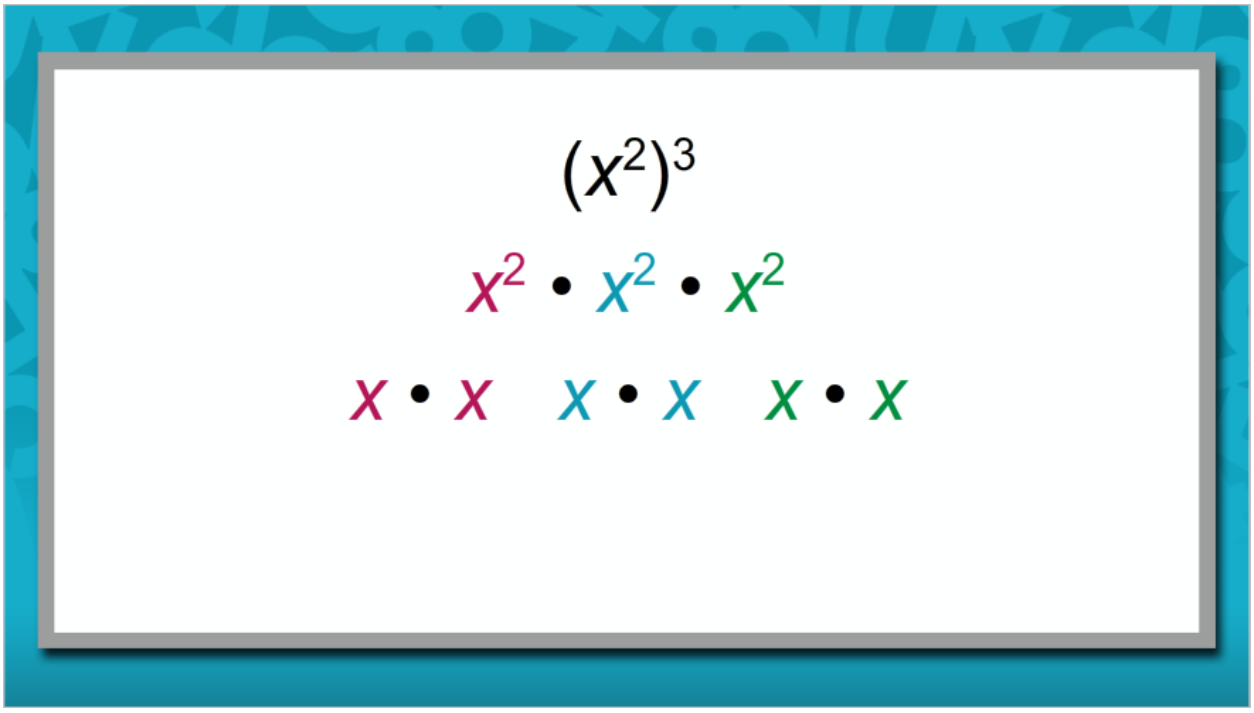
Recall that in an exponential expression, the base is the value that is multiplied; the exponent informs you how many times the base is used as a factor.

Power of a Power Property (continued)



For example, x raised to the third power equals x times x times x.

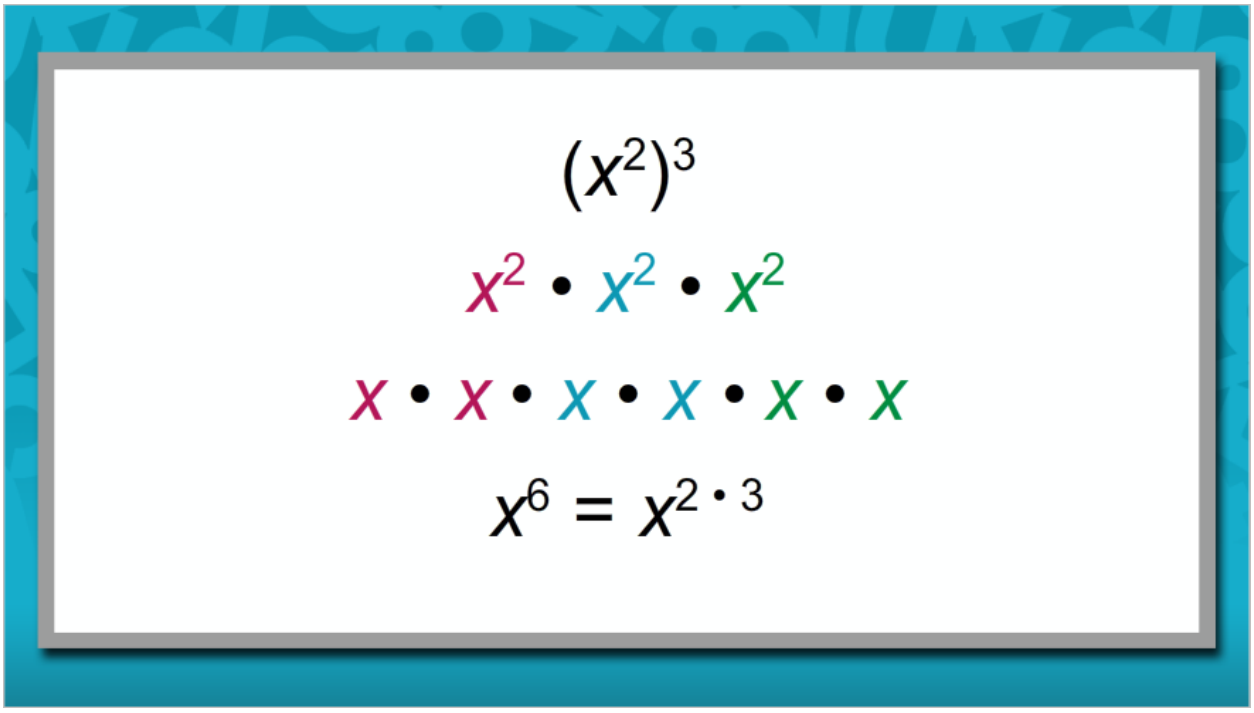
Power of a Power Property (continued)



Now consider the expression x squared raised to the third power. This expression is equivalent to x squared times x squared times x squared. Continue to expand this expression.

x squared represents x times x, so each x squared term represents this product.

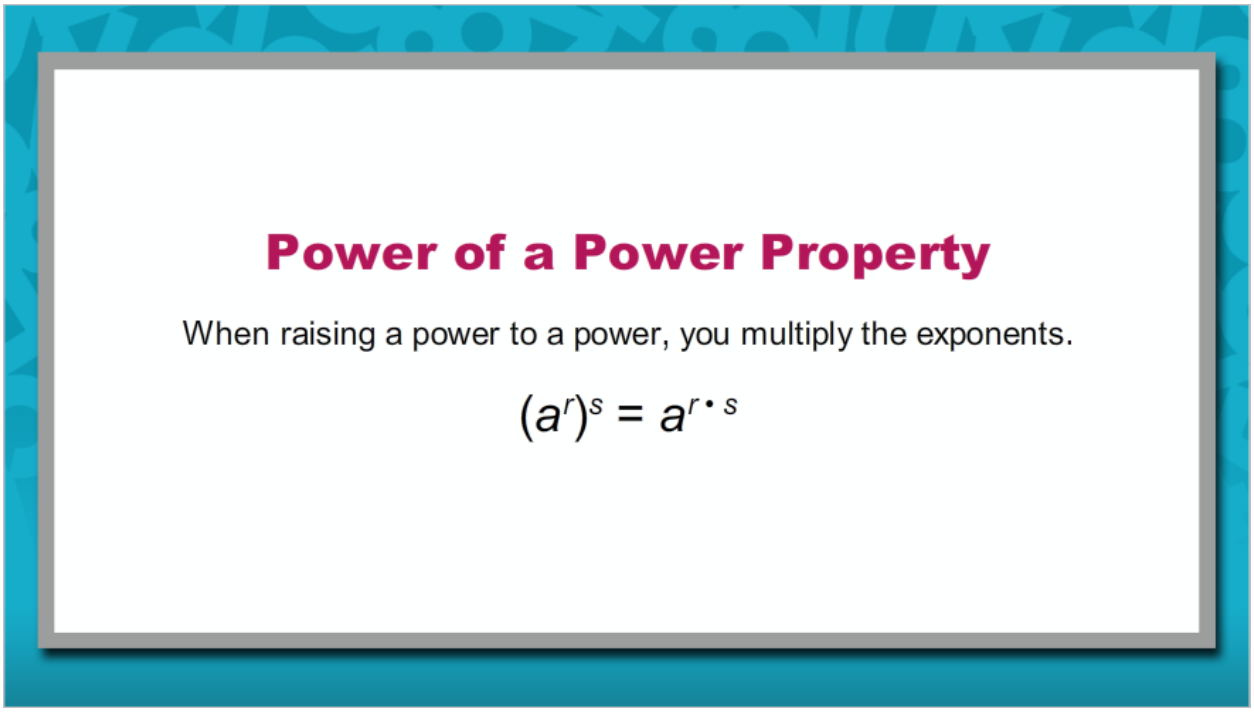
Power of a Power Property (continued)



After expanding each x squared term, you'll notice that you have an expression that represents the product of 6 x's, or in other words, x^6.

The exponent in the result is the product of the exponents in the original expression.

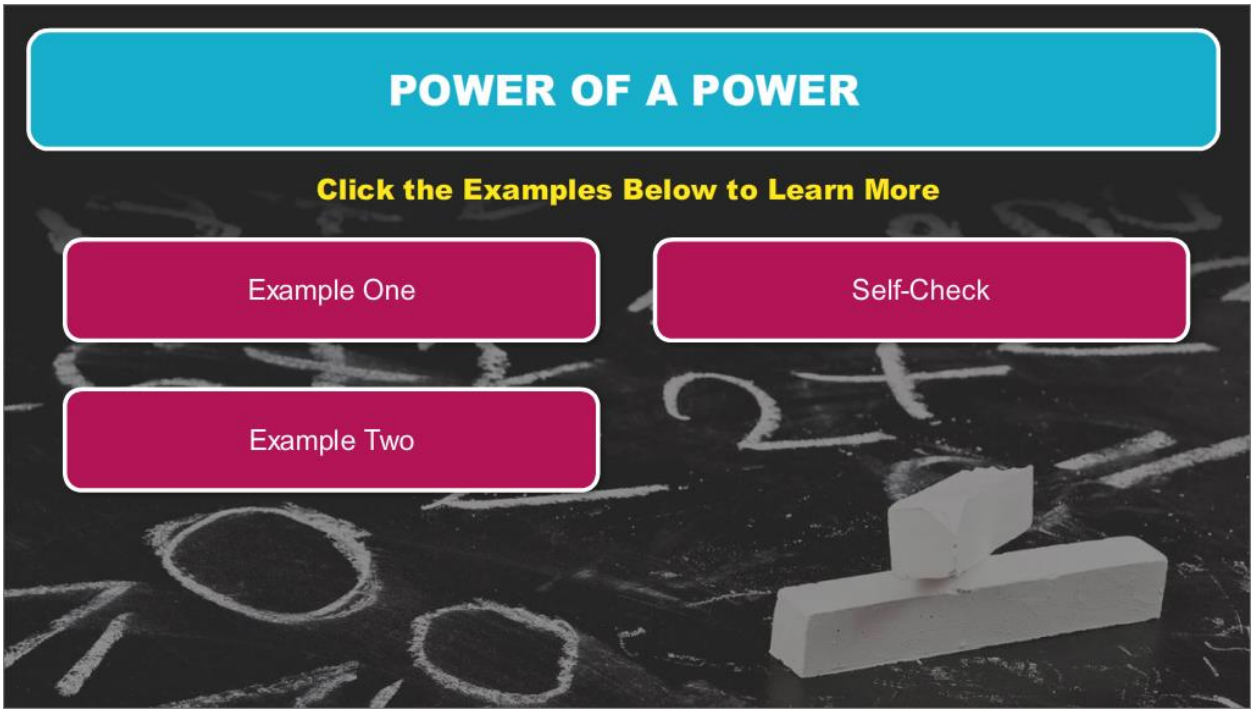
Power of a Power Property (continued)



This example shows the pattern that appears when you raise a power to a power, you multiply the exponents. This is known as the Power of a Power Property.

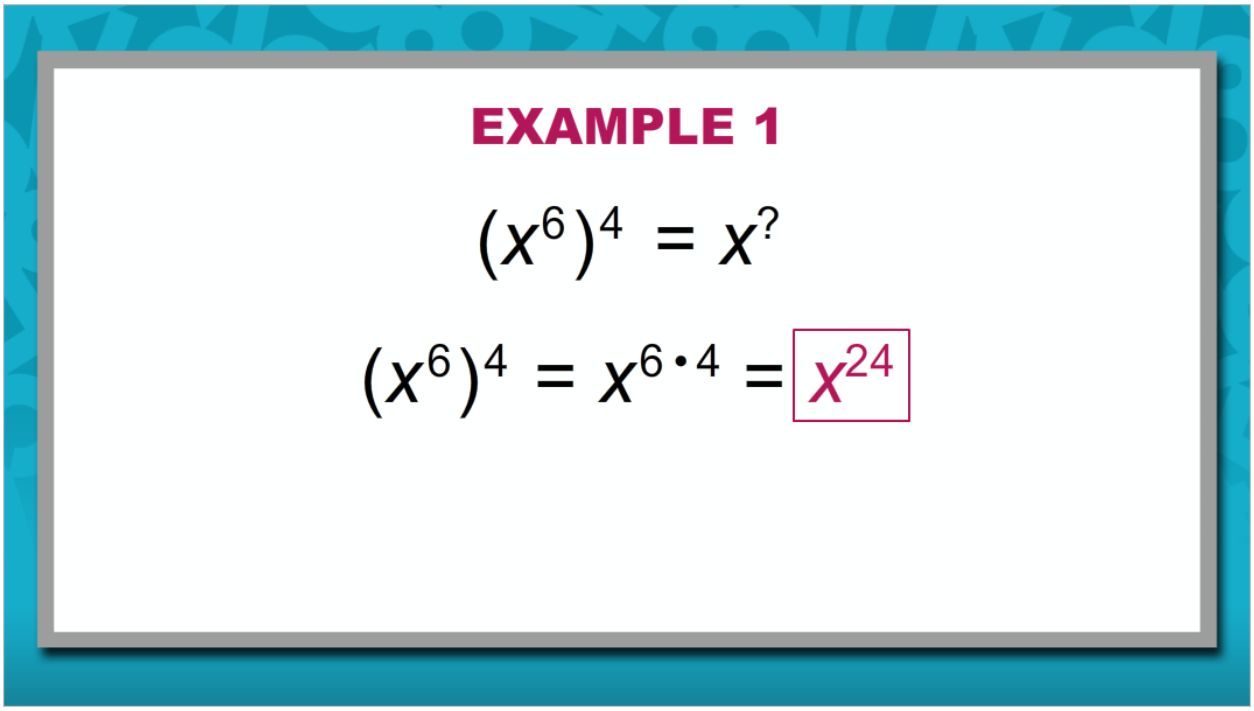
$$(a^r)^s = a^{r \cdot s}$$

Power of a Power



Click the examples below to learn more.

Example 1

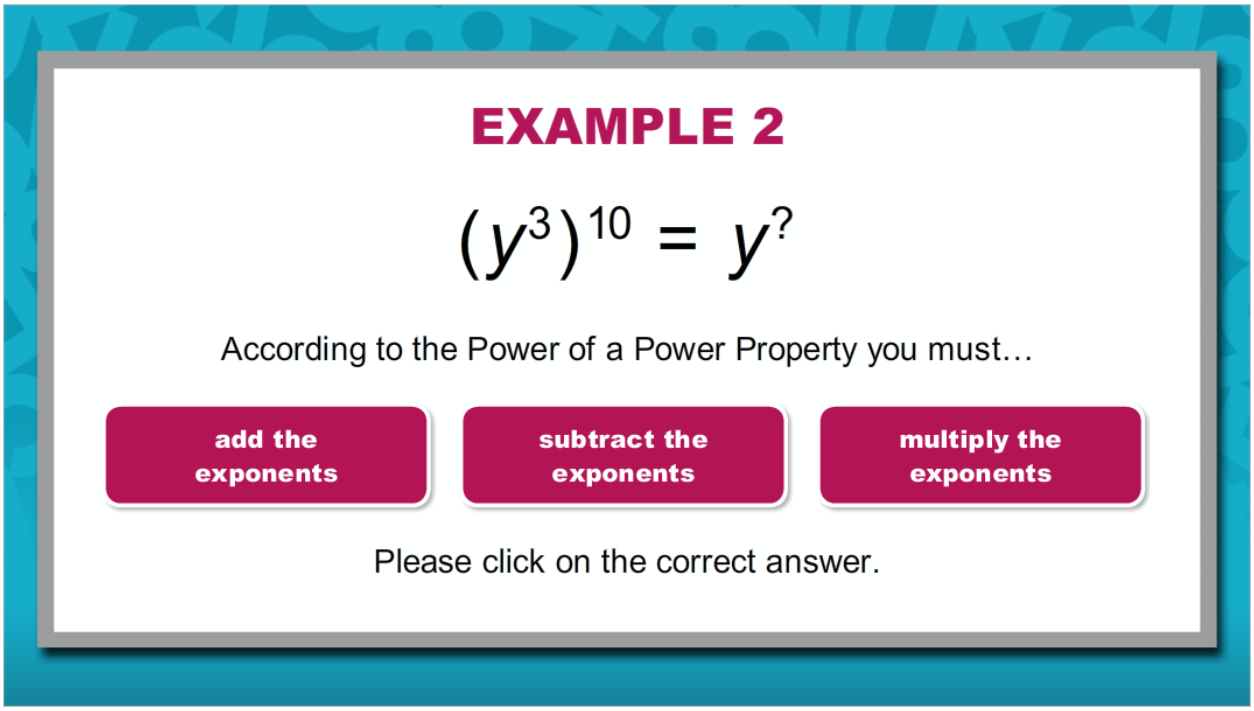


$(x^6)^4 = x^?$

In this example, you are asked to raise x^6 to the fourth power. According to the Power of a Power Property, you will need to multiply the exponents.

So, $(x^6)^4 = x^{6 \cdot 4} = x^{24}$.

Example 2



$(y^3)^{10} = y^?$

In this example, you are asked to raise y^3 to the tenth power. According to the Power of a Power Property, you must…

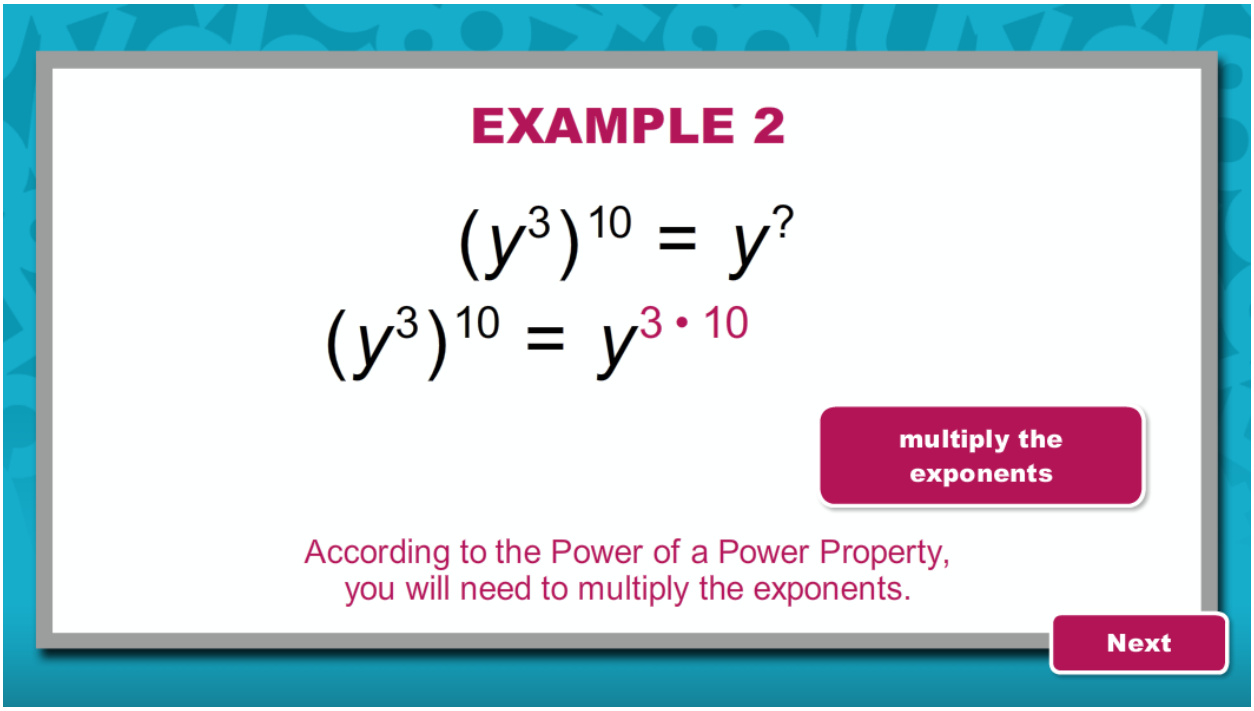
A) add the exponents

B) subtract the exponents

C) multiply the exponents

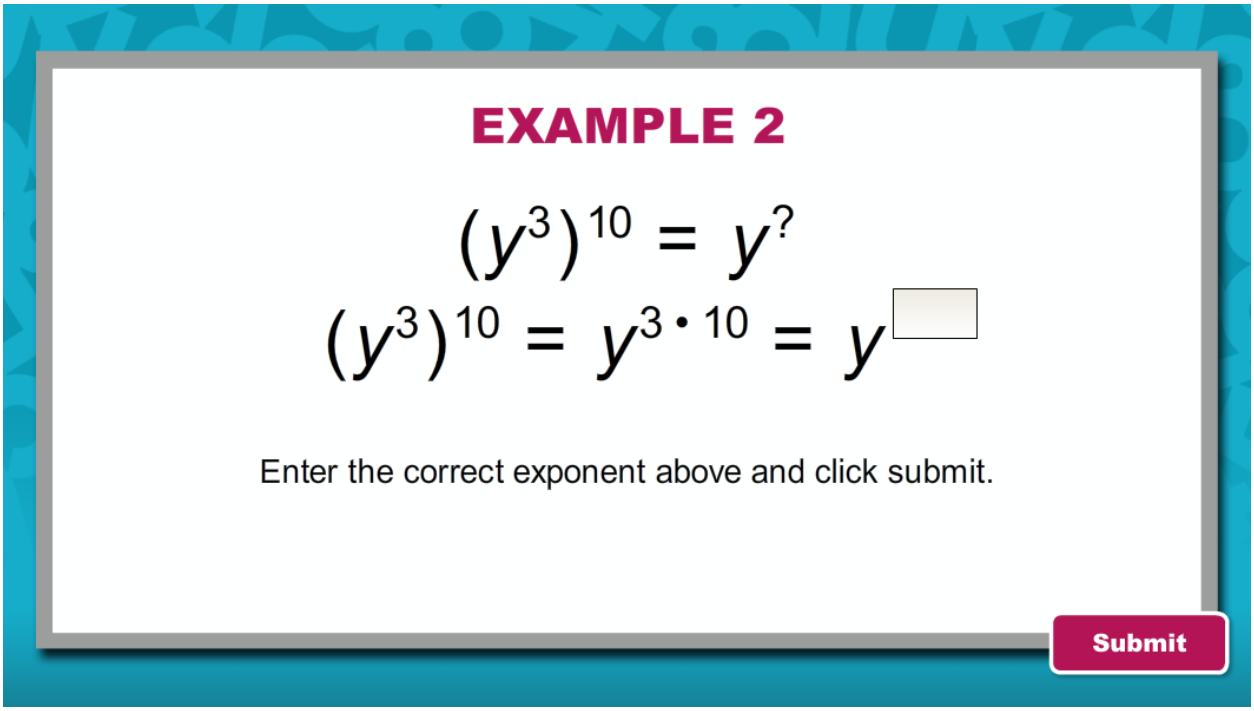
Please click on the correct answer.

Example 2 (continued)



Feedback: According to the Power of a Power Property, you will need to multiply the exponents.

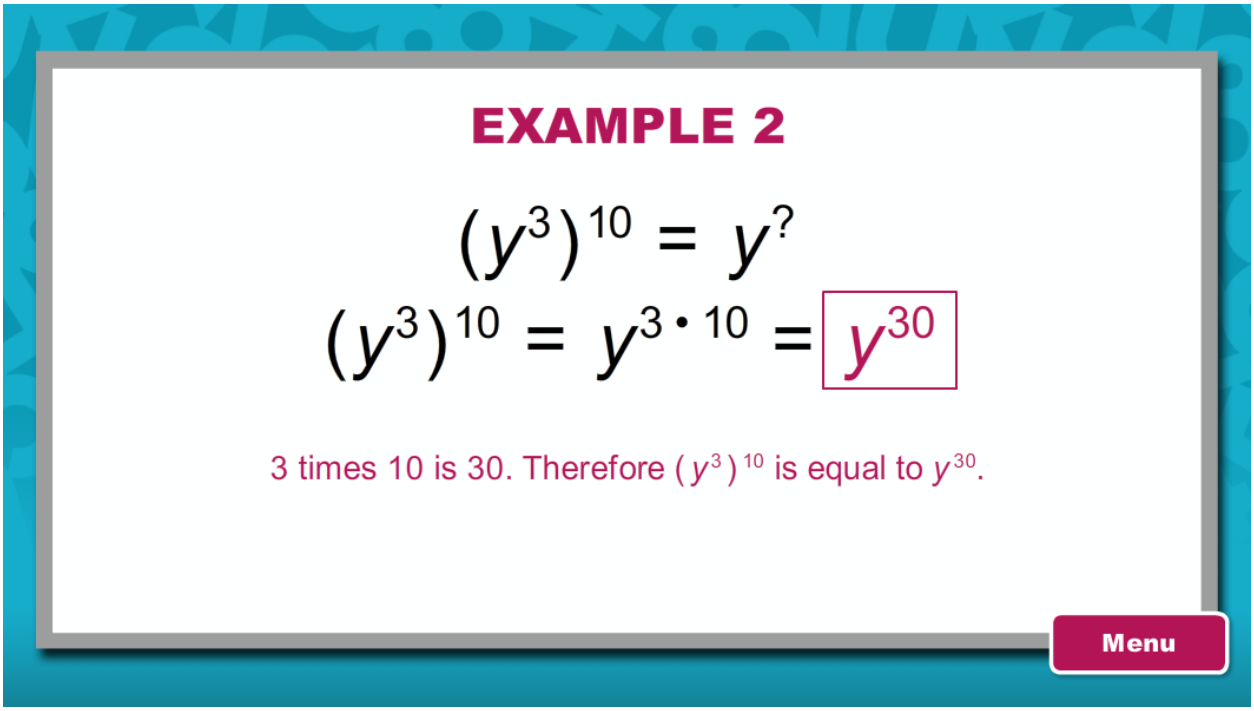
Example 2 (continued)



$(y^3)^{10} = y^{3 \cdot 10} = y^?$

Enter the correct exponent above and click submit.

Example 2 (continued)



Feedback:

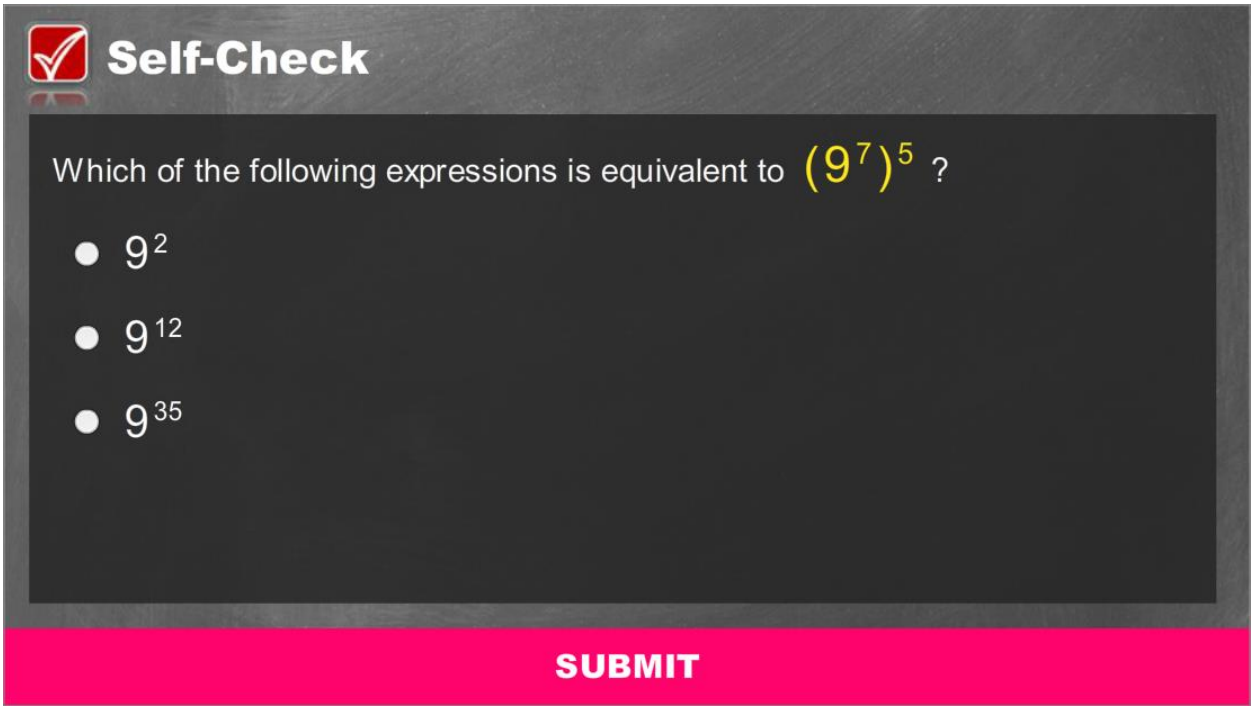
$(y^3)^{10} = y^{3 \cdot 10} = y^?$

$(y^3)^{10} = y^{3 \cdot 10} = y^{30}$

3 times 10 is 30. Therefore $(y^3)^{10}$ is equal to y^{30}.

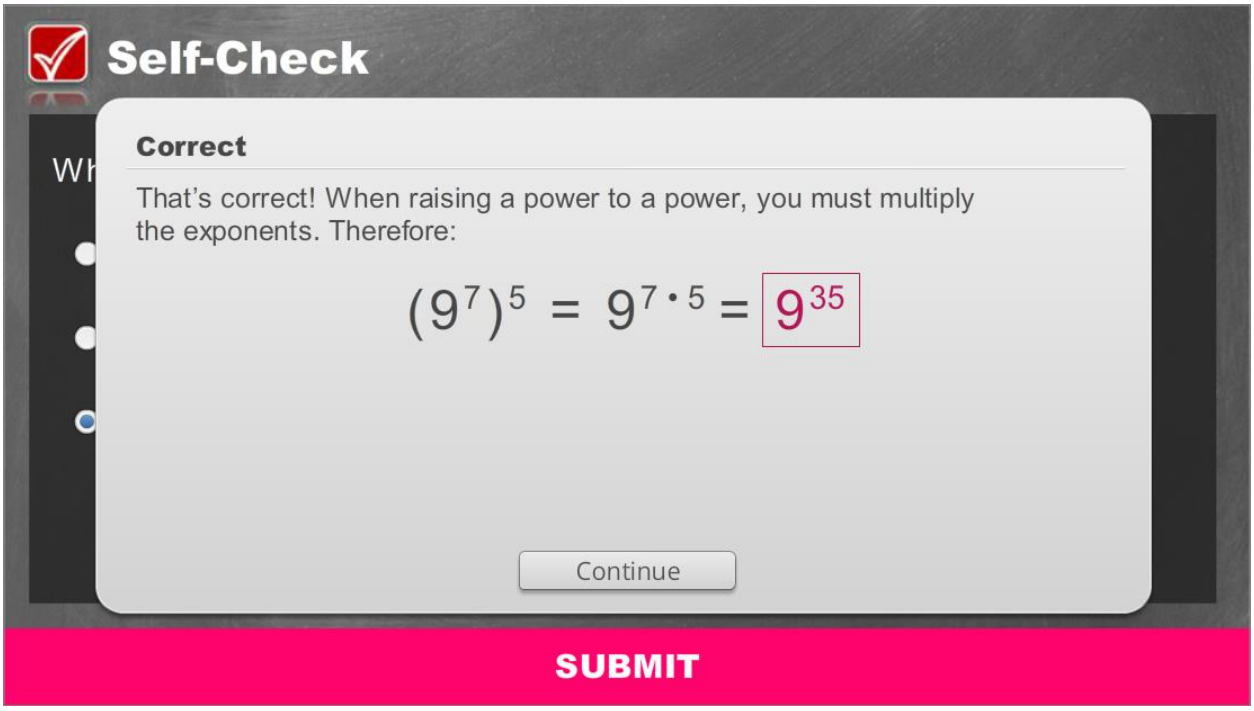
Your work is complete.

Self-Check



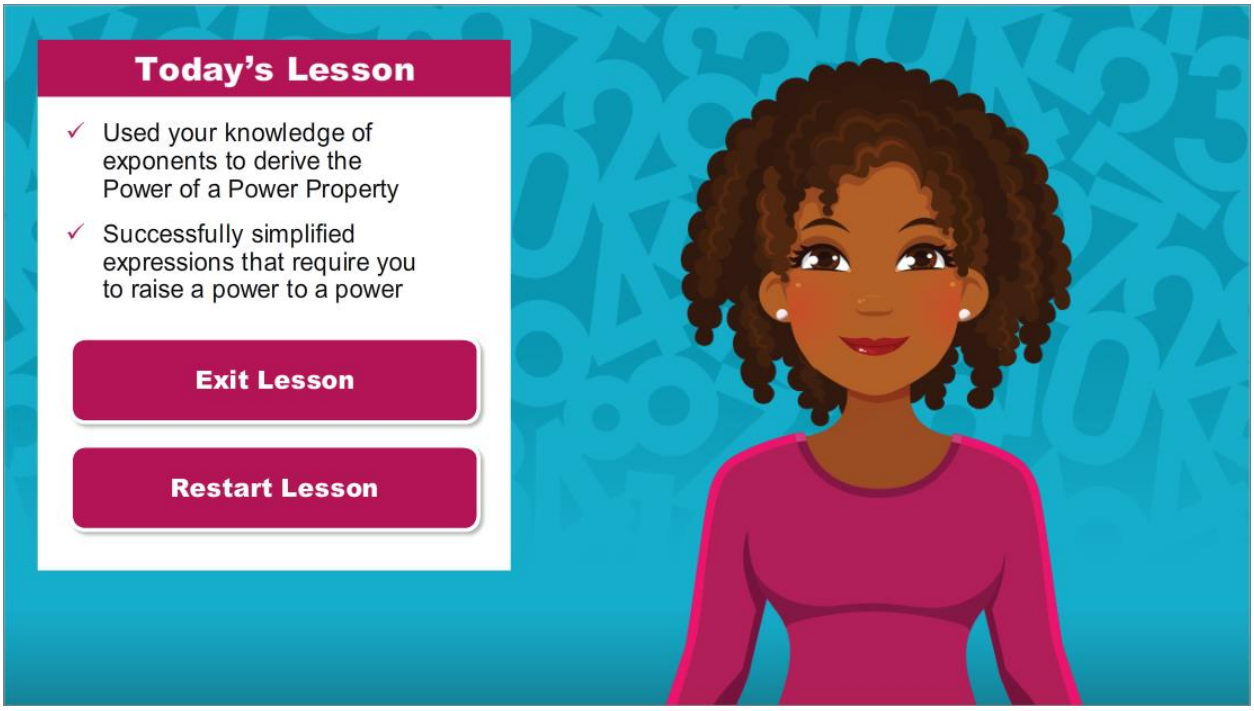
Solve the problem in the image above to check your understanding of the content.

Self-Check: Answer



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

Conclusion



Congratulations! In this lesson, you used your knowledge of exponents to discover a rule that allows you to easily simplify an expression that requires you to raise a power to a power.