

Module 2: Properties of Exponents

Topic 1: Power of a Power

Introduction



Today's Lesson

- You will apply your knowledge of exponents.
- You will learn how to simplify an expression that involves raising a power to a power.

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.

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Power of a Power Property

the base is value
that is multiplied

\times^3

the exponent informs you
how many times the base
is used as a factor

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.

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Power of a Power Property (continued)

$$x^3 = x \cdot x \cdot x$$

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

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Power of a Power Property (continued)

$$\begin{array}{c} (x^2)^3 \\ x^2 \cdot x^2 \cdot x^2 \\ x \cdot x \quad x \cdot x \quad x \cdot x \end{array}$$

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.

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Power of a Power Property (continued)

$$\begin{aligned} & (x^2)^3 \\ & x^2 \cdot x^2 \cdot x^2 \\ & x \cdot x \cdot x \cdot x \cdot x \cdot x \\ & x^6 = x^{2 \cdot 3} \end{aligned}$$

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.

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Power of a Power Property (continued)

Power of a Power Property

When raising a power to a power, you multiply the exponents.

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

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.

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

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Power of a Power

POWER OF A POWER

Click the Examples Below to Learn More

Example One

Self-Check

Example Two

The graphic features a dark background with faint chalkboard-style numbers and symbols. In the bottom right corner, there is a 3D rendering of a white rectangular block with a smaller white cube-like shape on top of it.

Click the examples below to learn more.

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Example 1

EXAMPLE 1

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

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

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

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

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Example 2

EXAMPLE 2

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

According to the Power of a Power Property you must...

add the exponents **subtract the exponents** **multiply the exponents**

Please click on the correct answer.

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

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.

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Example 2 (continued)

EXAMPLE 2

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

multiply the
exponents

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

Next

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

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Example 2 (continued)

EXAMPLE 2

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

Enter the correct exponent above and click submit.

Submit

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

Enter the correct exponent above and click submit.

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Example 2 (continued)

EXAMPLE 2

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

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

Menu

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.

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Self-Check

 **Self-Check**

Which of the following expressions is equivalent to $(9^7)^5$?

- 9^2
- 9^{12}
- 9^{35}

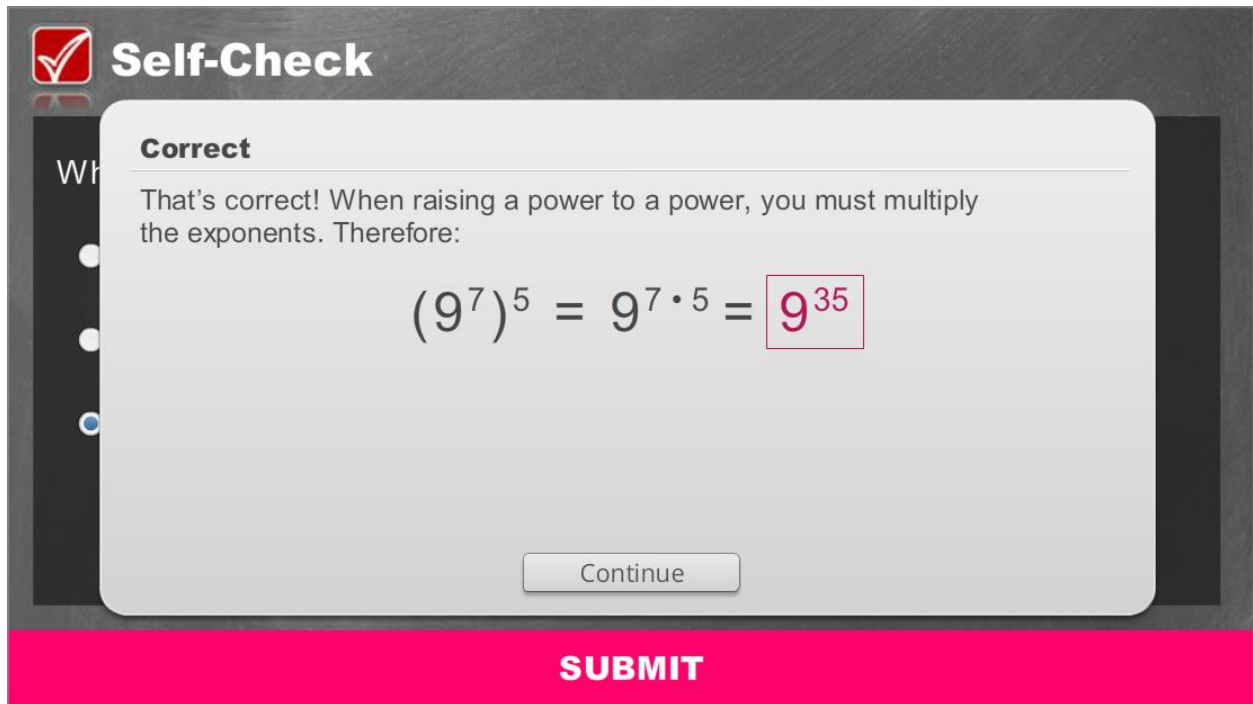
SUBMIT

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

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Self-Check: Answer



Self-Check

Correct

That's correct! When raising a power to a power, you must multiply the exponents. Therefore:

$$(9^7)^5 = 9^{7 \cdot 5} = 9^{35}$$

Continue

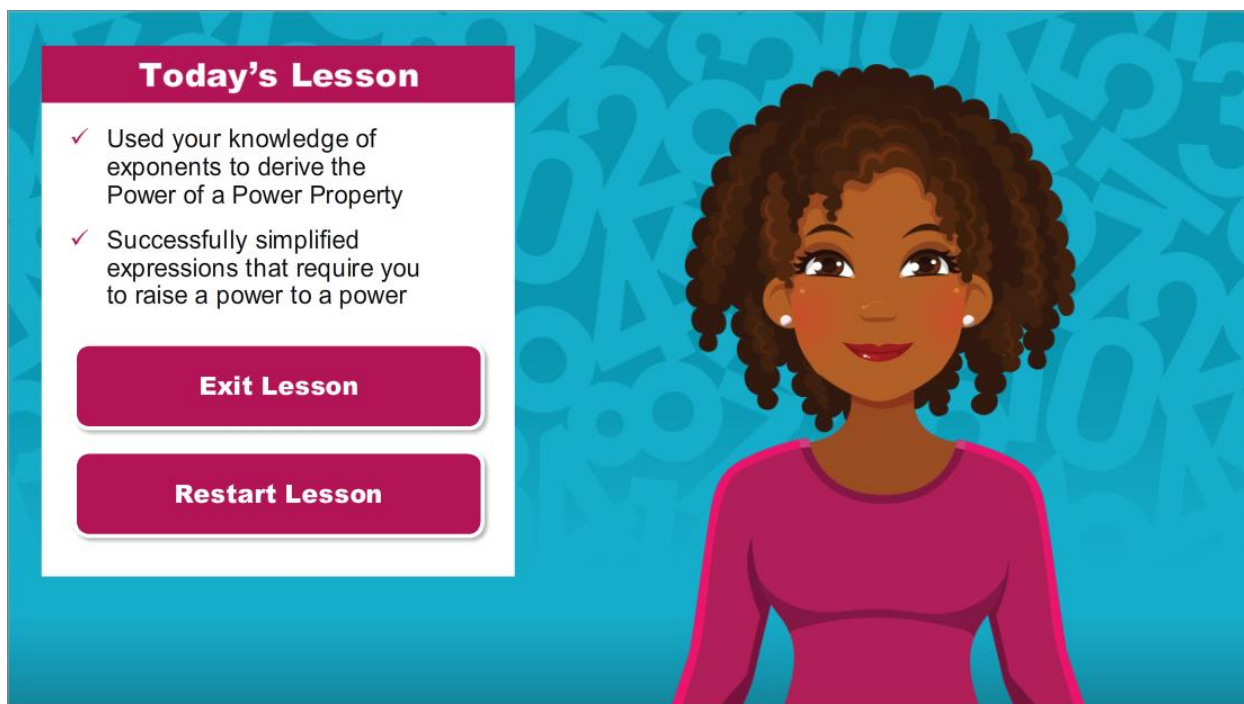
SUBMIT

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

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Conclusion



Today's Lesson

- ✓ Used your knowledge of exponents to derive the Power of a Power Property
- ✓ Successfully simplified expressions that require you to raise a power to a power

Exit Lesson

Restart Lesson

The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header contains a checklist of two items, both marked with a checkmark. Below the checklist are two pink buttons labeled 'Exit Lesson' and 'Restart Lesson'. To the right of this box is a large illustration of a woman with dark curly hair, wearing a pink top, set against a blue background with faint mathematical symbols like pi, infinity, and numbers.

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.