

Lesson 1.3 Powers of Powers Property

Objective

*Understand raising a power to a power

*Use properties of exponents to simplify expressions

- **Common Core State Standards** *8.EE.1*
- **Mathematical Practices** 4. Model mathematics. 5. Use tools strategically. 6. Attend to precision.

Lesson 1.3 Powers of Powers Property

Connect

(What's your first thought?)

Does $(4^2)^3$ equal 4^5 or 4^6 ?

← Write your response here

Simplify and write in exponential notation

$$(4^2)(4^3)$$

← Write your response here

Example 2: Simplify $(z^5)^2$

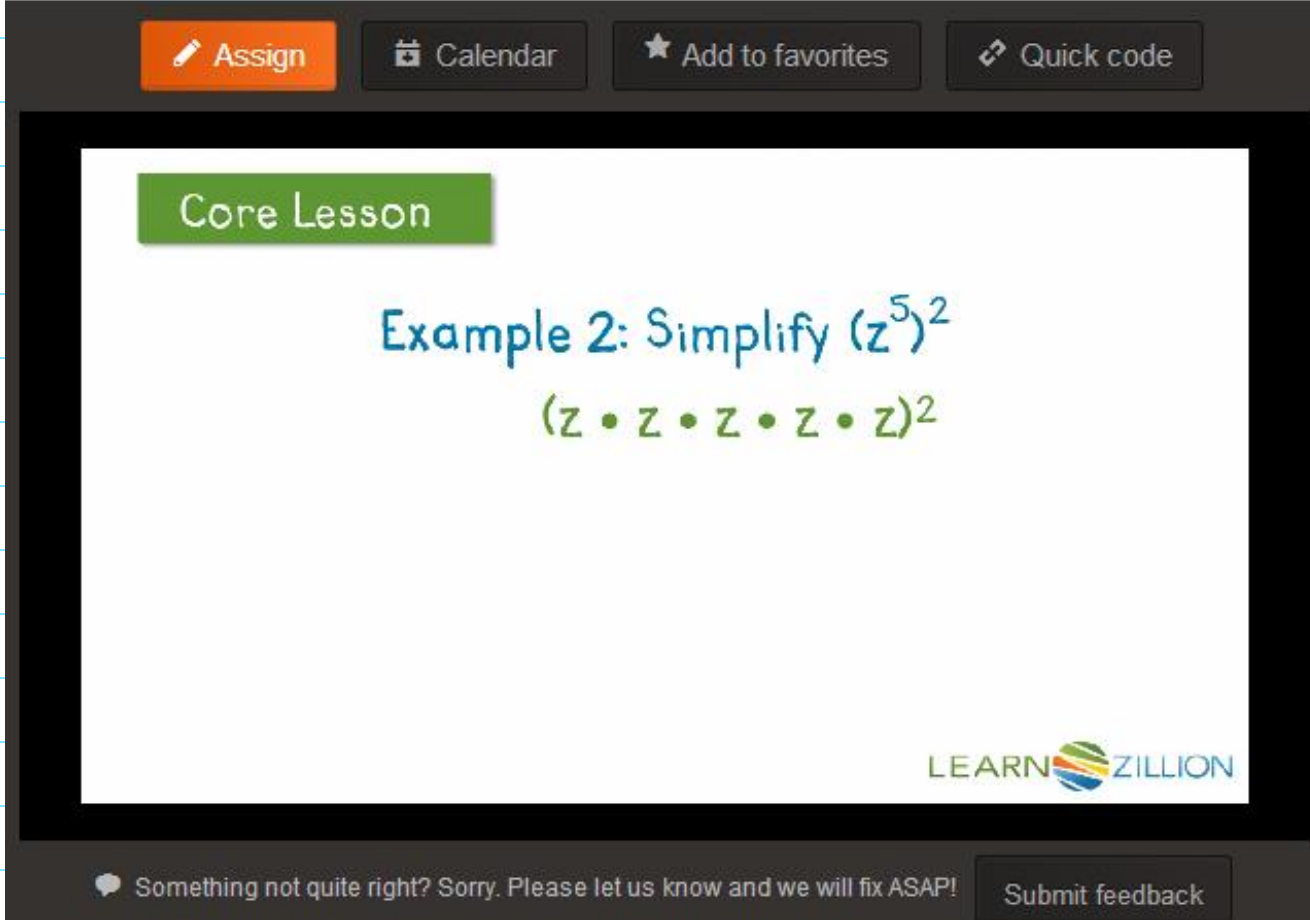
← Write your response here

What happens when you raise an exponential expression to a power?

← Write your response here

Objec

Lesson 1.3 Powers of Powers Property



The screenshot shows a digital lesson interface. At the top, there are four buttons: 'Assign' (orange), 'Calendar', 'Add to favorites', and 'Quick code'. Below these is a 'Core Lesson' header in a green box. The main content area displays the text 'Example 2: Simplify $(z^5)^2$ ' in blue, followed by the expanded form $(z \cdot z \cdot z \cdot z \cdot z)^2$ in green. The Learnzillion logo is in the bottom right corner. At the very bottom, there is a feedback prompt: 'Something not quite right? Sorry. Please let us know and we will fix ASAP!' and a 'Submit feedback' button.

Assign Calendar Add to favorites Quick code

Core Lesson

Example 2: Simplify $(z^5)^2$

$(z \cdot z \cdot z \cdot z \cdot z)^2$

LEARNZILLION

Something not quite right? Sorry. Please let us know and we will fix ASAP! Submit feedback

Go to Learnzillion
Enter Code LZ1515

Lesson 1.3 Powers of Powers

Powers of Powers Property

When you raise a power to a power, keep the base and multiply the exponents.

$$(a^m)^n = a^{m \cdot n} = a^{mn}$$

Lesson 1.3 Powers of Powers

Simplify each expression. Write your answer in exponential notation.

Example

a) $(3^4)^2$

b) $\left[\left(\frac{2}{7}\right)^6\right]^4$

Lesson 1.3 Powers of Powers

Simplify each expression. Write your answer in exponential notation.

Example

a) $(3^4)^2$

Solution

$$\begin{aligned}(3^4)^2 &= 3^{4 \cdot 2} \\ &= 3^8\end{aligned}$$

Use the power of a power property.
Simplify.

b) $\left[\left(\frac{2}{7}\right)^6\right]^4$

Solution

$$\begin{aligned}\left[\left(\frac{2}{7}\right)^6\right]^4 &= \left(\frac{2}{7}\right)^{6 \cdot 4} \\ &= \left(\frac{2}{7}\right)^{24}\end{aligned}$$

Use the power of a power property.
Simplify.

Lesson 1.3 Powers of Powers

Simplify each expression. Write your answer in exponential notation.

Example

c) $[(2a)^5]^3$

d) $[(-x)^4]^3$

Lesson 1.3 Powers of Powers

Simplify each expression. Write your answer in exponential notation.

c) $[(2a)^5]^3$

Solution

$$\begin{aligned} [(2a)^5]^3 &= (2a)^{5 \cdot 3} \\ &= (2a)^{15} \end{aligned}$$

Use the power of a power property.
Simplify.

$(2a)^{15}$ means "Use the expression $2a$ as a factor 15 times."



d) $[(-x)^4]^3$

Solution

$$\begin{aligned} [(-x)^4]^3 &= (-x)^{4 \cdot 3} \\ &= (-x)^{12} \\ &= x^{12} \end{aligned}$$

Use the power of a power property.
Simplify the exponent.
Simplify.

Lesson 1.3 Powers of Powers Property

Independent Practice #1-13

Practice 1.3

Simplify each expression. Write your answer in exponential notation.

1 $(2^6)^2$

2 $(3^4)^3$

3 $(10^5)^4$

4 $(10^7)^2$

5 $(25^3)^3$

6 $(x^6)^3$

7 $\left[\left(\frac{1}{8}\right)^3\right]^6$

8 $\left[\left(\frac{4}{5}\right)^2\right]^4$

9 $[(2y)^3]^8$

10 $[(57p)^4]^4$

11 $[(-6)^4]^3$

12 $[(-p)^2]^{11}$



Lesson Check 1, 9

*can raise a power to a power & express the answer with a single exponent

Lesson 1.3 Powers of Powers

Understanding of Learning

Lesson 1.3 The Power of a Power



Ticket Out the Door

Using your own words and algebraic notation, explain how to raise a power to a power.