Lesson 1.3 Powers of Powers Property
Day 2

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

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

a) $[(-4)^2 \cdot (-4)^3]^6$

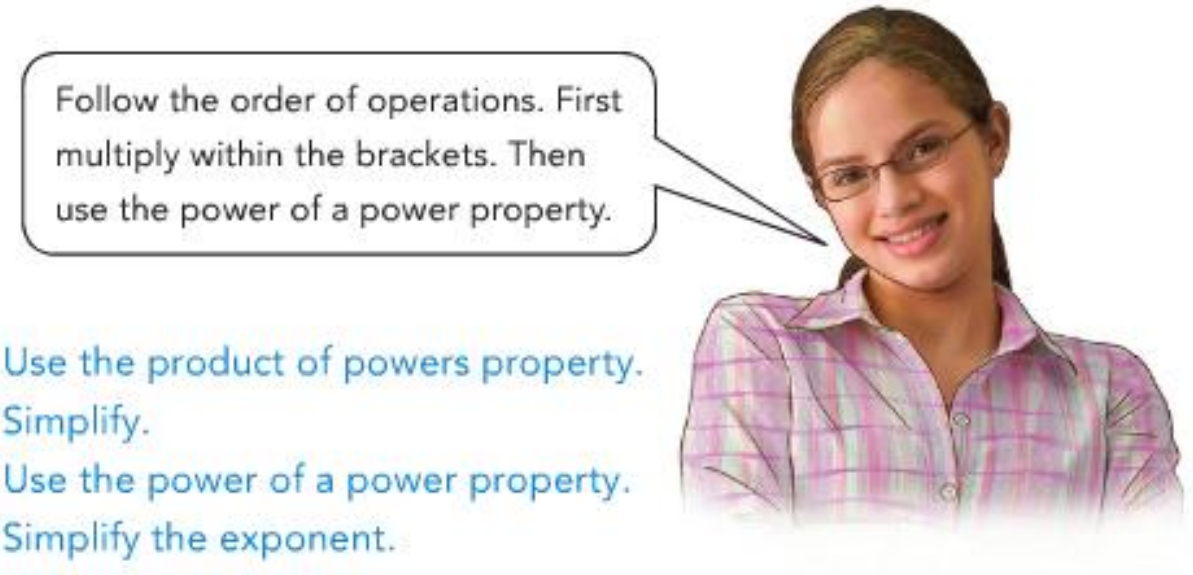
Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

a) $[(-4)^2 \cdot (-4)^3]^6$

Solution



$$
\begin{aligned}
[(-4)^2 \cdot (-4)^3]^6 &= [(-4)^{2+3}]^6 && \text{Use the product of powers property.} \\
&= [(-4)^5]^6 && \text{Simplify.} \\
&= (-4)^{5 \cdot 6} && \text{Use the power of a power property.} \\
&= (-4)^{30} && \text{Simplify the exponent.} \\
&= 4^{30} && \text{Simplify.}
\end{aligned}
$$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

b) $(m^5 \cdot m)^3$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

b) $(m^5 \cdot m)^3$

Solution

$$(m^5 \cdot m)^3 = (m^{5+1})^3 \quad \text{Use the product of powers property.}$$
$$= (m^6)^3 \quad \text{Simplify.}$$
$$= m^{6 \cdot 3} \quad \text{Use the power of a power property.}$$
$$= m^{18} \quad \text{Simplify.}$$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

c) $\dfrac{(6^4 \cdot 6^3)^4}{(6^2)^5}$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

c) $\dfrac{(6^4 \cdot 6^3)^4}{(6^2)^5}$

Solution

$$\frac{(6^4 \cdot 6^3)^4}{(6^2)^5} = \frac{(6^{4+3})^4}{6^{2 \cdot 5}}$$

$$= \frac{(6^7)^4}{6^{10}}$$

$$= \frac{6^{7 \cdot 4}}{6^{10}}$$

$$= \frac{6^{28}}{6^{10}}$$

$$= 6^{28 - 10}$$

$$= 6^{18}$$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

d) $(a^4 \cdot a^2)^4 \div 2a^8$

Lesson 1.3 Powers of Powers

You may need to use more than one property of exponents to simplify some expressions.

Simplify each expression. Write your answer in exponential notation.

d) $(a^4 \cdot a^2)^4 \div 2a^8$

Solution

$$(a^4 \cdot a^2)^4 \div 2a^8 = (a^{4+2})^4 \div 2a^8$$ Use the product of powers property.

$$= (a^6)^4 \div 2a^8$$ Simplify.

$$= a^{6 \cdot 4} \div 2a^8$$ Use the power of a power property.

$$= a^{24} \div 2a^8$$ Simplify.

$$= \frac{a^{24-8}}{2}$$ Use the quotient of powers property.

$$= \frac{a^{16}}{2}$$ Simplify.

Lesson 1.3 Powers of Powers

Your Turn

$$(6^3 \cdot 6^3)^7 \div 6^{10}$$

$$\frac{(x^8 \cdot x^4)^2}{(x^3)^4}$$

Lesson 1.3 Powers of Powers

Your Turn

$(6^3 \cdot 6^3)^7 \div 6^{10}$

$(6^3 \cdot 6^3)^7 \div 6^{10} = \_\_?\_\_ \div \_\_?\_\_$	Use the ? of powers property.	$(6^{3+3})^7$; 6^{10}; product
$= \_\_?\_\_ \div \_\_?\_\_$	Simplify.	$(6^6)^7$; 6^{10}
$= \_\_?\_\_ \div \_\_?\_\_$	Use the ? of a power property.	$(6^{6 \cdot 7})$; 6^{10}; power
$= \_\_?\_\_ \div \_\_?\_\_$	Simplify.	6^{42}; 6^{10}
$= \_\_?\_\_$	Use the ? of powers property.	6^{42-10}; quotient
$= \_\_?\_\_$	Simplify.	6^{32}

Lesson 1.3 Powers of Powers

Your Turn

$$\frac{(x^8 \cdot x^4)^2}{(x^3)^6}$$

$\frac{(x^8 \cdot x^4)^2}{(x^3)^6}$

$\frac{(x^8 \cdot x^4)^2}{(x^3)^6} = \frac{?}{?}$ $\frac{(x^{8+4})^2}{x^{3 \cdot 6}}$ Use the ? of powers and ? of a power properties. product; power

$= \frac{?}{?}$ Simplify. $\frac{(x^{12})^2}{x^{18}}$

$= \frac{?}{?}$ Use the ? of a power property. $\frac{x^{12 \cdot 2}}{x^{18}}$

$= \frac{?}{?}$ Simplify. $\frac{x^{24}}{x^{18}}$

$= \underline{\ ?\ }$ Use the ? of powers property. x^{24-18}; quotient

$= \underline{\ ?\ }$ Simplify. x^6

Lesson 1.3 Powers of Powers Property

Independent Practice #14-27

Challenge #28 & 29

Practice 1.3

Simplify each expression. Write your answer in exponential notation.

14. $(5^5 \cdot 5^6)^2$

15. $(p^4 \cdot p^2)^6$

16. $\left[\left(\frac{1}{2}\right) \cdot \left(\frac{1}{2}\right)^3\right]^5$

17. $\left[\left(-\frac{4}{9}\right)^2 \cdot \left(-\frac{4}{9}\right)^3\right]^2$

18. $(2^2 \cdot 2^4)^3 \div 2^8$

19. $(7 \cdot 7^2)^5 \div 7^3$

20. $(s^6 \cdot s)^2 \div s^4$

21. $(t^4 \cdot t^4)^4 \div t^4$

22. $\frac{(8^8 \cdot 8^3)^2}{(8^5)^4}$

23. $\frac{(3^4 \cdot 3^2)^4}{(3^5)^2}$

24. $\frac{(b \cdot b^3)^5}{(b^2)^4}$

25. $\frac{(h^6 \cdot h^4)^2}{(h^3)^5}$

Lesson Check *14, 20*

*can use the properties of exponents to simplify exponential expressions

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.