

## Pre-Algebra

**Essential Question:** How can the laws (properties) of exponents help us simplify and evaluate exponential expressions?

**Do Now:** Marissa evaluated the exponential expression  $(2^3)^2$  as follows:

$$(2^3)^2$$
$$(2 \cdot 2 \cdot 2)^2$$
$$8^2$$
$$64$$

a) Do you think Marissa evaluated the expression correctly?

b) Can you think of another way to evaluate the expression? Show your method below.



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## Powers Raised to Powers

Complete the table below. Draw a conclusion about  $(a^m)^n$ .

Expression	Expanded	Simplified as a Single Power
$(3^2)^3$	$3^2 \cdot 3^2 \cdot 3^2$	
$(4^3)^5$	$4^3 \cdot 4^3 \cdot 4^3 \cdot 4^3 \cdot 4^3$	

**Rule (Law) #5:**

Rewrite each expression as a single power using a positive exponent.

1.  $(5^3)^9$

2.  $(4^3)^2$

3.  $(x^3)^2$

4.  $(n^4)^3$

5.  $(a^5)^8$

6.  $(y^{-4})^2$

## The Laws of Exponents ( $a \neq 0$ )

Law #1	Law #2	Law #3	Law #4	Law #5
$a^0 = 1$	$a^{-n} = \frac{1}{a^n}$	$a^m \cdot a^n = a^{m+n}$	$\frac{a^m}{a^n} = a^{m-n}$	$(a^m)^n = a^{mn}$

Simplify completely and/or evaluate using the "laws of exponents".

7.  $(a^3)^{-5}$

8.  $(19^3)^0$

9.  $(h^{-3})^3$

10.  $(x^2)^8 \div (x^2)^4$

11.  $(2^2 \cdot 2^{-4})^3$

12.  $(a^3 \cdot a^2 \cdot a^{-3})^2$

13.  $(p^4 \div p^6)^3$



In this unit we learned five rules (laws) that help us simplify and evaluate exponential expressions.