

Write in Expanded form & Evaluate

$$2^3 = 2 \cdot 2 \cdot 2 = 8$$

$$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$$

$$2^{10} = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \\ = 1024$$

### Homework Questions

# 8.1 Multiplication Properties of Exponents

## Goals:

- Use multiplication properties of exponents.

## EQ:

Write an example when you **Add** the exponents, then when you would **Multiply** the exponents.

**The Unit Organizer**

NAME \_\_\_\_\_  
DATE \_\_\_\_\_ Mo/Date/Year

④ BIGGER PICTURE Algebra 1.5 Concepts

② LAST UNIT/Experience <b>Systems</b>	① CURRENT UNIT <b>Exponents &amp; Exponential Functions</b>	③ NEXT UNIT/Experience <b>Quadratics</b>
⑧ Student Activities or Assignments  8.1 8.2 8.3 8.4 8.5 8.6 8.7	⑤ UNIT MAP  	⑥ UNIT RELATIONSHIPS  Simplify Graph Apply Represent
⑦ UNIT SELF-TEST QUESTIONS  1. What properties can be used to simplify & evaluate exponential expressions? 2. What do exponential graphs look like? 3. Can you write numbers in both decimal form and in scientific notation? 4. How can exponential growth and decay equations be used to represent and solve real world problems?		

**MULTIPLICATION PROPERTIES OF EXPONENTS**

Let  $a$  and  $b$  be numbers and let  $m$  and  $n$  be positive integers.

★ **Product of Powers Property**

To multiply powers having the same base, add the exponents.

$a^m \cdot a^n = a^{m+n}$

$2^5 \cdot 2^3 = 2^{5+3} = 2^8$   
 $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

★ **Power of a Power Property**

To find a power of a power, multiply the exponents.

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

$(2^3)^4 = 2^{12}$

★ **Power of a Product Property**

To find a power of a product, find the power of each factor and

multiply  
 $(a \cdot b)^m = a^m \cdot b^m$

$(2z^4)^3 = 2^3 z^{12}$

**Example 1: Use the Product of Powers Property**

Write the expression as a single power of the base.

$$\text{a) } 4^3 \cdot 4^5 = 4^8$$

$$\underline{4 \cdot 4 \cdot 4} \cdot \underline{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}$$

$$\text{b) } \underline{(-3)} \underline{(-3)^7} = (-3)^8$$

~~$$-3^8$$~~

$$\text{c) } y^4 \cdot y^5 \cdot y^6 = y^{15}$$

**Example 2: Use the Power of a Power Property**

Write the expression as a single power of the base.

$$\text{a) } (7^3)^5 = 7^{15}$$

$$\text{b) } (x^2)^5 = x^{10}$$

**Try It**      Simplify the expression.

$$1) \underbrace{(-4)^3} \cdot \underbrace{(-4)^6} = (-4)^9$$

$$2) \underbrace{w^{10}} \cdot \underbrace{w} = w^{11}$$

$$3) \underbrace{m^4} \cdot \underbrace{m^2} \cdot \underbrace{m^5} = m^{11}$$

Write the expression as a single power of the base.

$$4) (6^4)^5 = 6^{20}$$

$$5) [(-5)^3]^6 = (-5)^{18}$$

$$6) (n^9)^3 = n^{27}$$

**Example 3: Use the Power of a Product Property**

Simplify the expression.

$$\begin{aligned} \text{a) } (2 \cdot 3)^3 &= 2^3 \cdot 3^3 \\ &= 8 \cdot 27 \\ &= 216 \end{aligned}$$

$$\begin{aligned} \text{b) } (9xy)^2 &= 9^2 x^2 y^2 \\ &= 81x^2y^2 \end{aligned}$$

**Homework Day 1**8.1 wkst Raising Exponents to a Power  
(p.31)