Algebra 1

Lesson 8.1

Apply Exponent Properties Involving Products

Warm-Up

Evaluate each expression.

(a) a^2 *when* $a = -6$ $(-6)^2 = 36$

(b) x^4 *when* $x = 3$ $(3)^4 = 81$

(c) m^3 *when* $m = -2$ $(-2)^3 = -8$

Exponents

$x^3 = x \cdot x \cdot x = x$ to the third power

Base is x Exponent (or power) is 3

Properties of Exponents

$a^m \cdot a^n = a^{(m+n)}$ (Product of Powers)

$(a^m)^n = a^{mn}$ (Power of a Power)

$(ab)^m = a^m b^m$ (Power of a Product)

Example 1. Use the Product of Powers Property

Simplify the expression. You do not need to evaluate your answer like the Warm-Up, just write the answer using exponents.

(a) $4^7 \cdot 4^6$ $= 4^{7+6}$ $= 4^{13}$

(b) $(-3)^3 \cdot (-3)^1$ $= (-3)^{3+1}$ $= (-3)^4$

(c) $8^5 \cdot 8^1 \cdot 8^2$ 8^{5+1+2} 8^8

(d) $b^1 \cdot b^3 \cdot b^5$ b^{1+3+5} b^9

Example 2. Use the Power of a Power Property

Simplify the expression. You do not need to evaluate your answer like the Warm-Up, just write the answer using exponents.

(a) $(7^4)^5$ $7^{4 \cdot 5}$ 7^{20}

(b) $[(-3)^4]^2$ $(-3)^{4 \cdot 2}$ $(-3)^8$

(c) $(y^3)^3$ $(y)^{3 \cdot 3}$ y^9

(d) $[(x+3)^2]^5$ $(x+3)^{2 \cdot 5}$ $(x+3)^{10}$

$-1(5x)^2$

Example 3. Use the Power of a Product Property
Simplify the expression. You do not need to evaluate the variable part of the answer, just write the answer using exponents.

(a) $(5\cdot 9)^6$ $5^6 \cdot 9^6$

(b) $(3mn)^3$ $3^3 m^3 n^3$ $27m^3n^3$

(c) $(-2g)^2$ $(-2)^2 g^2$ $4g^2$

(d) $-(5x)^2$ $-(5^2x^2)$ $-(25x^2)$ $-25x^2$

Example 4. Combining Properties (Order of Operations)
Simplify the expression. You do not need to evaluate the variable part of the answer, just write the answer using exponents.

(a) $(4x)\cdot(2x)^3$ $(4x)\cdot(2^3x^3)$ $(4x)\cdot(8x^3)$ $(4\cdot 8)\cdot(x^1\cdot x^3)$ $32x^4$

(b) $(3d^5)^3\cdot(d^2)$ $(3^3d^{15})\cdot(d^2)$ $27d^{17}$

(c) $(-3m)^2\cdot(2m^3)^2$ $(9m^2)\cdot(4m^6)$ $36m^8$

Try It!
Simplify the expression.

(a) $3a(-2a^3)$ $-6a^4$

(b) $-6c^3d(-3c^8d^2)$ $18c^{11}d^3$

(c) $(-3b^4)^3$ $-27b^{12}$

(d) $(-2c^2d)^3$ $-8c^6d^3$

Assignment

New: Pg. 492 #4 - 38 (evens)

Review:

Solve by using the method of your choice (graphing, substitution, or elimination).

1. $y = 2x - 1$
   $3y + 2x = 21$

2. $2y + x = 7$
   $3x - 4y = 1$

3. $x + 3y = 2$
   $3x = 9y + 15$