

7-1 Study Guide and Intervention

Multiplication Properties of Exponents

Multiply Monomials A **monomial** is a number, a variable, or the product of a number and one or more variables with nonnegative integer exponents. An expression of the form x^n is called a **power** and represents the product you obtain when x is used as a factor n times. To multiply two powers that have the same base, add the exponents.

Product of Powers	For any number a and all integers m and n , $a^m \cdot a^n = a^{m+n}$.
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Example 1 Simplify $(3x^6)(5x^2)$.

$$(3x^6)(5x^2) = (3)(5)(x^6 \cdot x^2)$$

Group the coefficients and the variables

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

Product of Powers

$$= 15x^8$$

Simplify.

The product is $15x^8$.

Example 2 Simplify $(-4a^3b)(3a^2b^5)$.

$$(-4a^3b)(3a^2b^5) = (-4)(3)(a^3 \cdot a^2)(b \cdot b^5)$$

$$= -12(a^{3+2})(b^{1+5})$$

$$= -12a^5b^6$$

The product is $-12a^5b^6$.

Lesson 7-1

Exercises

Simplify each expression.

1. $y(y^5)$
 y^6

2. $n^2 \cdot n^7$
 n^9

3. $(-7x^2)(x^4)$
 $-7x^6$

4. $x(x^2)(x^4)$
 x^7

5. $m \cdot m^5$
 m^6

6. $(-x^3)(-x^4)$
 x^7

7. $(2a^2)(8a)$
 $16a^3$

8. $(rn)(rn^3)(n^2)$
 r^2n^6

9. $(x^2y)(4xy^3)$
 $4x^3y^4$

10. $\frac{1}{3}(2a^3b)(6b^3)$
 $4a^3b^4$

11. $(-4x^3)(-5x^7)$
 $20x^{10}$

12. $(-3j^2k^4)(2jk^6)$
 $-6j^3k^{10}$

13. $(5a^2bc^3)\left(\frac{1}{5}abc^4\right)$
 $a^3b^2c^7$

14. $(-5xy)(4x^2)(y^4)$
 $-20x^3y^5$

15. $(10x^3yz^2)(-2xy^5z)$
 $-20x^4y^6z^3$

7-1 Study Guide and Intervention *(continued)*

Multiplication Properties of Exponents

Simplify Expressions An expression of the form $(x^m)^n$ is called a **power of a power** and represents the product you obtain when x^m is used as a factor n times. To find the power of a power, multiply exponents.

Power of a Power	For any number a and any integers m and p , $(a^m)^p = a^{mp}$.
Power of a Product	For any numbers a and b and any integer m , $(ab)^m = a^m b^m$.

We can combine and use these properties to simplify expressions involving monomials.

Example Simplify $(-2ab^2)^3(a^2)^4$.

$$\begin{aligned}
 (-2ab^2)^3(a^2)^4 &= (-2ab^2)^3(a^8) && \text{Power of a Power} \\
 &= (-2)^3(a^3)(b^2)^3(a^8) && \text{Power of a Product} \\
 &= (-2)^3(a^3)(a^8)(b^2)^3 && \text{Group the coefficients and the variables} \\
 &= (-2)^3(a^{11})(b^2)^3 && \text{Product of Powers} \\
 &= -8a^{11}b^6 && \text{Power of a Power}
 \end{aligned}$$

The product is $-8a^{11}b^6$.

Exercises

Simplify each expression.

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|---|---|--|
| 1. $(y^5)^2$
y^{10} | 2. $(n^7)^4$
n^{28} | 3. $(x^2)^5(x^3)$
x^{13} |
| 4. $-3(ab^4)^3$
$-3a^3b^{12}$ | 5. $(-3ab^4)^3$
$-27a^3b^{12}$ | 6. $(4x^2b)^3$
$64x^6b^3$ |
| 7. $(4a^2)^2(b^3)$
$16a^4b^3$ | 8. $(4x)^2(b^3)$
$16x^2b^3$ | 9. $(x^2y^4)^5$
$x^{10}y^{20}$ |
| 10. $(2a^3b^2)(b^3)^2$
$2a^3b^8$ | 11. $(-4xy)^3(-2x^2)^3$
$512x^9y^3$ | 12. $(-3j^2k^3)^2(2j^2k)^3$
$72j^{10}k^9$ |
| 13. $(25a^2b)^3\left(\frac{1}{5}abf\right)^2$
$625a^8b^5f^2$ | 14. $(2xy)^2(-3x^2)(4y^4)$
$-48x^4y^6$ | 15. $(2x^3y^2z^2)^3(x^2z)^4$
$8x^{17}y^6z^{10}$ |
| 16. $(-2n^6y^5)(-6n^3y^2)(ny)^3$
$12n^{12}y^{10}$ | 17. $(-3a^3n^4)(-3a^3n)^4$
$-243a^{15}n^8$ | 18. $-3(2x)^4(4x^5y)^2$
$-768x^{14}y^2$ |