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8-1 Study Guide and Intervention

Multiplying Monomials

Multiply Monomials A **monomial** is a number, a variable, or a product of a number and one or more variables. 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, $a^m \cdot a^n = a^{m+n}$.

Example 1 **Simplify $(3x^6)(5x^2)$.**

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

$= (3 \cdot 5)(x^{6+2})$ 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 8-1

Exercises

Simplify.

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

8-1 Study Guide and Intervention *(continued)*

Multiplying Monomials

Powers of Monomials 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 all integers m and n, $(a^m)^n = a^{mn}$.
Power of a Product	For any number a and all integers m and n, $(ab)^m = a^m b^m$.

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

$(-2ab^2)^3(a^2)^4 = (-2ab^2)^3(a^8)$	Power of a Power
$= (-2)^3(a^3)(b^2)^3(a^8)$	Power of a Product
$= (-2)^3(a^3)(a^8)(b^2)^3$	Commutative Property
$= (-2)^3(a^{11})(b^2)^3$	Product of Powers
$= -8a^{11}b^6$	Power of a Power

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

Exercises

Simplify.

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. $(25a^2b)^3\left(\frac{1}{5}abc\right)^2$ $625a^8b^5c^2$

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. $-3(2x)^4(4x^5y)^2$ $-768x^{14}y^2$

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8-2 Study Guide and Intervention

Dividing Monomials

Quotients of Monomials To divide two powers with the same base, subtract the exponents.

Quotient of Powers	For all integers m and n and any nonzero number a, $\frac{a^m}{a^n} = a^{m-n}$.
Power of a Quotient	For any integer m and any real numbers a and b, $b \neq 0$, $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$.

Example 1 **Simplify $\frac{a^4b^7}{ab^2}$. Assume neither a nor b is equal to zero.**

$\frac{a^4b^7}{ab^2} = \left(\frac{a^4}{a}\right)\left(\frac{b^7}{b^2}\right)$ Group powers with the same base.

$= (a^{4-1})(b^{7-2})$ Quotient of Powers

$= a^3b^5$ Simplify.

The quotient is a^3b^5 .

Example 2 **Simplify $\left(\frac{2a^3b^5}{3b^2}\right)^3$. Assume that b is not equal to zero.**

$\left(\frac{2a^3b^5}{3b^2}\right)^3 = \frac{(2a^3b^5)^3}{(3b^2)^3}$ Power of a Quotient

$= \frac{2^3(a^3)^3(b^5)^3}{(3)^3(b^2)^3}$ Power of a Product

$= \frac{8a^9b^{15}}{27b^6}$ Power of a Power

$= \frac{8a^9b^9}{27}$ Quotient of Powers

The quotient is $\frac{8a^9b^9}{27}$.

Exercises

Simplify. Assume that no denominator is equal to zero.

1. $\frac{5^5}{5^2}$ 5^3 or 125

2. $\frac{m^6}{m^4}$ m^2

3. $\frac{p^5n^4}{p^2n}$ p^3n^3

4. $\frac{a^2}{a}$ a

5. $\frac{x^5y^3}{x^5y^2}$ y

6. $\frac{-2y^7}{14y^5}$ $-\frac{1}{7}y^2$

7. $\frac{xy^6}{y^4x}$ y^2

8. $\left(\frac{2a^2b}{a}\right)^3$ $8a^3b^3$

9. $\left(\frac{4p^4q^4}{3p^2q^2}\right)^3$ $\frac{64}{27}p^6q^6$

10. $\left(\frac{2v^5w^3}{v^4w^3}\right)^4$ $16v^4$

11. $\left(\frac{3r^6s^3}{2r^5s}\right)^4$ $\frac{81}{16}r^4s^8$

12. $\frac{r^7s^7t^2}{s^3r^3t^2}$ r^4s^4

Lesson 8-2

11) $\frac{2n^2}{n} = 2n$

12) $\frac{8x^3}{10x^5} = \frac{4}{5x^2}$

13) $\frac{12x^3}{9y^8} = \frac{4x^3}{3y^8}$

14) $\frac{14x^4y^7}{6x^5y^4} = \frac{7y^3}{3x}$

15) $\frac{11u^4}{17u^7v^9} = \frac{11}{17u^3v^9}$

16) $\frac{4y^4}{14yx^8} = \frac{2y^3}{7x^8}$

17) $\frac{12yx^4}{10yx^8} = \frac{6}{5x^4}$

18) $\frac{18x^8y^8}{10x^3} = \frac{9x^5y^8}{5}$

19) $\frac{5n^8}{20n^8} = \frac{1}{4}$

20) $\frac{16yx^4}{9x^8y^2} = \frac{16}{9x^4y}$