7.1 MULTIPLYING MONOMIALS

A monomial is a number, a variable, or a product or a number and one or more variables.

Monomials that are real numbers are called constants.

These are monomials...

4 k $4k$

$\frac{1}{2}xy^2$

These are not...

$4+k$ $4-k$

$\frac{4}{k}$

MULTIPLICATION PROPERTIES OF EXPONENTS

PRODUCT OF POWERS

multiply

$$(a)^m \cdot (a)^n = a^{m+n}$$ ← add exp.

same base ↑ ↑ keep base

EXAMPLES

Simplify the expression. Write your answer using exponents.

1. $5^3 \cdot 5^6 = 5^{3+6} = 5^9$

2. $(-2)^1(-2)^4$ $(-2)^{1+4} = (-2)^5$

3. $x^4 \cdot x^3 \cdot x^2$ $x^{4+3+2} \rightarrow x^9$

4. $(-3)^1(-3)^5(-3)^2$ $(-3)^{1+5+2} = (-3)^8$

YOU TRY...

Simplify the expression. Write your answer using exponents.

a) $7^8 \cdot 7 = 7^9$

b) $g^2 \cdot g^5 \cdot g^9 = g^{16}$

c) $(-9)^4(-9)^4 = (-9)^8$

POWER OF A POWER

$$(a^m)^n = a^{mn}$$ mult. exp.

keep base

EXAMPLES

Simplify the expression. Write your answer using exponents.

5. $(4^3)^6 = 4^{3\cdot 6} = 4^{18}$ **6.** $(p^8)^4 = p^{8\cdot 4} = p^{32}$

7. $[(-6)^4]^2 = (-6)^{4\cdot 2} = (-6)^8$ **8.** $(k^5)^5 = k^{5\cdot 5} = k^{25}$

YOU TRY...

Simplify the expression. Write your answer using exponents.

a) $(5^2)^3 = 5^6$

b) $(h^7)^4 = h^{28}$

c) $[(-2)^3]^4 = (-2)^{12}$

POWER OF A PRODUCT

$$(ab)^n = a^n b^n$$

EXAMPLES *Simplify the expression.*

9. $(-6 \cdot 5)^2$

$(-6)^2 \cdot (5)^2$

$36 \cdot 25 = 900$

10. $(2xy)^4$

$(2)^4 (x)^4 (y)^4$

$16x^4y^4$

11. $-(2w)^2$

$-(2)^2 (w)^2 = -4w^2$

12. $(7gh)^3$

$(7)^3 (g)^3 (h)^3$

$343g^3h^3$

YOU TRY...

Simplify the expression.

a) $(3 \cdot 4)^2 = 9 \cdot 16 = 144$

b) $(4ef)^6 = 4096e^6f^6$

c) $(-7k)^5 = -16807k^5$

USING ALL THREE PROPERTIES

EXAMPLES *Simplify the expression.*

13. $(4x^2y)^3 \cdot x^5$

$(4)^3(x^{2\cdot3})(y)^3 \cdot x^5$

$64x^6y^3 \cdot x^5$

$64x^{11}y^3$

14. $(-3a^4)^2 \cdot a^7$

$(-3)^2(a^{4\cdot2}) \cdot a^7$

$9a^8 \cdot a^7$

$9a^{15}$

15. $9 \cdot (9z^5)^2$

$9 \cdot (9)^2(z^{5\cdot2})$

$9 \cdot 81z^{10}$

$729z^{10}$

16. $(2mn^6)^3 \cdot 3m^7$

$(2)^3(m)^3(n^{6\cdot3}) \cdot 3m^7$

$8m^3n^{18} \cdot 3m^7$

$24m^{10}n^{18}$

YOU TRY...

Simplify the expression.

a) $(3mn^2)^4 \cdot 2m^2$

$(3)^4(m)^4(n^{2\cdot4}) \cdot 2m^2$

$81m^4n^8 \cdot 2m^2$

$162m^6n^8$

b) $(-2c^3d^2)^3 \cdot 5cd^6$

$(-2)^3(c^{3\cdot3})(d^{2\cdot3}) \cdot 5cd^6$

$-8c^9d^6 \cdot 5cd^6$

$-40c^{10}d^{12}$