Algebra 2 Notes Name Key

5.1 Use Properties of Exponents- *Multiplying Monomials*

STARTER PROBLEM

How could you write each of the following differently?

$4x = x + x + x + x$ (4 ← coefficient)

$x^4 = x \cdot x \cdot x \cdot x$ (4 ← exponent)

In your own words, explain what the difference is between a **coefficient** of a variable and an **exponent**; meaning what does each one tell you?

Coefficient: how many times the variable is added.

Exponent: how many times the variable (base) is multiplied.

	Expanded Form	Simplified
1. $a^5 \cdot a^2$	$aaaaa \cdot aa$	a^7
2. $(a^5)^2$	$(a^5)(a^5) = (aaaaa)(aaaaa)$	a^{10}
3. $(4a^2)^3$	$(4a^2)(4a^2)(4a^2) = (4aa)(4aa)(4aa)$	$64a^6$
4. $(3a^2b^3)^2$	$(3a^2b^3)(3a^2b^3) = (3aabbb)(3aabbb)$	$9a^4b^6$

Rules for Multiplying Monomials

Product of Powers	$a^m \cdot a^n$	a^{m+n}
1. $b^4 \cdot b^7 = b^{4+7} = b^{11}$		
Power to a Power	$(a^m)^n$	$a^{m \cdot n}$
2. $(x^3)^4 = x^{3 \cdot 4} = x^{12}$		
Product to a Power	$(ab)^m$	$a^m b^m$
3. $(5b^3)^2 = (5)^2 (b^3)^2 = 25b^6$		
Monomial to a Power	$(a^m b^n)^p$	$a^{mp} b^{np}$
4. $(2x^4y^3)^2 = (2)^2 (x^4)^2 (y^3)^2 = 4x^8y^6$		

Remember: An exponent affects what is to its immediate left!!!

$3 \cdot 4^2 = 3 \cdot 16 = 48$

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

or $= (12)^2 = 144$

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

or $= (-12)^2 = 144$

$-(3 \cdot 4)^2 = -(3)^2 \cdot (4)^2 = -1(9)(16) = -144$

or $= -(12)^2 = -144$

Examples- Simplify the following expressions:

5. $2x^5 \cdot x^3$

$2x^5 \cdot 1x^3$

$(2 \cdot 1) \cdot (x^5 \cdot x^3)$

$2x^8$

6. $(-3x^2a^3)(2x^2a)$

$(-3 \cdot 2)(x^2x^2)(a^3a)$

$-6x^4a^4$

7. $(2x^5)^3$

$(2)^3 (x^5)^3$

$8x^{15}$

8. $\left(\frac{-2x}{3}\right)^2$ $\quad \frac{(-2x)^2}{(3)^2} = \frac{(-2)^2(x)^2}{9}$

$= \frac{4x^2}{9}$

9. $\left(\frac{1}{2}a^2b\right)^3$

$\left(\frac{1}{2}\right)^3 (a^2)^3 (b)^3$

$\frac{1}{8}a^6b^3$ or $\frac{a^6b^3}{8}$

10. $(2a^4)(a^3b)(-2a^2b^3)^2$

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

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

$8a^{11}b^7$

11. $9\left(\frac{1}{3}a^3b^4\right)^2$

$9\left(\frac{1}{3}\right)^2 (a^3)^2 (b^4)^2$

$9\left(\frac{1}{9}\right)a^6b^8$

a^6b^8

12. $(-4x^5)^3$

$(-4)^3 (x^5)^3$

$-64x^{15}$

13. $(-5a^3)^2 + (3a)^3$

$(-5)^2(a^3)^2 + (3)^3(a)^3$

$25a^6 + 27a^3$

* Not like terms

14. $(5a^3)^2 + (2a^2)^3$

$(5)^2(a^3)^2 + (2)^3(a^2)^3$

$25a^6 + 8a^6$

$33a^6$