

Name: Key Date: _____ Period: _____

Algebra 1
Properties of Exponents
Day 1

Identify the base and the exponent. Then, write it out in expanded form and simplify if possible.

1.) x^3
base: x
exponent: 3
 $x \cdot x \cdot x$

2.) 3^4
base: 3
exponent: 4
 $3 \cdot 3 \cdot 3 \cdot 3 = 81$

3.) $(-2)^3$
base: -2
exponent: 3
 $(-2)(-2)(-2) = 8$

4.) $(-5)^2$
base: (-5)
exponent: 2
 $(-5)(-5) = 25$

Write out in expanded form. Then, identify a rule you could use for the product of powers.

1.) $4^2 \cdot 4^4$
 $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$
 4^6
4096

2.) $a^5 \cdot a^3$
 $a \cdot a \cdot a \cdot a \cdot a \cdot a \cdot a$
 a^8

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

4.) $3x^2 \cdot 6x^4$
 $18x^6$

5.) $(-4a^4)(-6a)$
 $24a^5$

6.) $-2x^4y^2 \cdot 5xy^3$
 $-10x^5y^5$

Rule # 1: Product of Powers Property $a^m \cdot a^n = a^{m+n}$

When you multiply powers that have the same base:

keep the base and add the exponents

Write out in expanded form. Then, identify a rule you could use for the power of a power.

1.) $(2^2)^3$
 $2^2 \cdot 2^2 \cdot 2^2$
 $2^6 = 64$

2.) $(x^5)^3$
 $x^5 \cdot x^5 \cdot x^5$
 x^{15}

3.) $(a^4)^4$
 $a^4 \cdot a^4 \cdot a^4 \cdot a^4$
 a^{16}

Rule #2: Power of a Power Property $(a^m)^n = a^{mn}$

When you have a power of a power:

keep the base and multiply the exponents

Write out in expanded form. Then, identify a rule you could use for the power of a product.

1.) $(2x)^3$

$2x \cdot 2x \cdot 2x$
 $8x^3$

2.) $(3 \cdot 4)^2 \xrightarrow{\text{or}} (12)^2$

$(3 \cdot 4)(3 \cdot 4)$ 144
 $3^2 \cdot 4^2$
144

3.) $(-2xy)^4$

$(-2xy)(-2xy)(-2xy)(-2xy)$
 $16x^4y^4$

Rule #3: Power of a Product Property $(ab)^m = a^m b^m$

When you have a power of a product:

"distribute" the exponent to all parts

Mixed Practice: Simplify the following.

1.) $(h^4)^5$

h^{20}

2.) $y^3 \cdot y^6$

y^9

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

$16x^2$

4.) $(-a^3b^2)^5$ ← odd exponent = - answer
 $-a^{15}b^{10}$

5.) $(-a^1b^6)^4$ ← even exponent = + answer
 $a^{16}b^{24}$

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

$24a^7b^4$

7.) $-3^2 \cdot 3^5$

-3^2 or $-(3)^2 = -9$

$-3^7 = -2187$

8.) $(-4)^2 \cdot (-4)^6$

$(-4)^8$

65536

9.) $(-3wv^4)^2$

$9w^2v^8$

10.) $(-st^2)^3 \cdot st$

$s^2t^4 \cdot st$

s^3t^5

11.) $-3x^5 \cdot 4x^1$

$-12x^6$

12.) $(x^2y)^3$

x^6y^3