Algebra 1: Problem Set 8A

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Name _____

Date _____ Period _____

POWERS & EXPONENTS – REVIEW

By now, you should have noticed some interesting properties about multiplying and dividing powers and exponents. Let *a* and *b* be numbers (or variables), and *m* and *n* be integers (positive or negative!). These shortcuts are fun, but you should **ALWAYS** be able to double-check your work by doing some problems the "long way."

Product of Powers Property $a^m \cdot a^n = a^{m+n}$

"To multiply powers with the same base, ADD the exponents."

Examples: $x^5 \cdot x^3 = x^{5+3} = x^8$

$y^7 \cdot y^{-2} = y^{7+(-2)} = y^5$

Power of a Power Property $(a^m)^n = a^{m \cdot n}$

"To find the power of a power, MULTIPLY the exponents."

Examples: $(x^5)^3 = x^{5 \cdot 3} = x^{15}$

$(5^7)^{-2} = 5^{7 \cdot (-2)} = 5^{-14} = \dfrac{1}{5^{14}}$

Power of a Product Property $(a \cdot b)^n = a^n \cdot b^n$

"To find a power of a product,, find the power of each factor and multiply."

Examples: $(xy)^3 = x^3 y^3$

$(xy)^{-2} = x^{-2} y^{-2} = \dfrac{1}{x^2 y^2}$

Quotient of Powers Property $\dfrac{a^m}{a^n} = a^{m-n}$

"To divide powers having the same base, subtract the exponents."

Example: $\dfrac{x^7}{x^3} = \dfrac{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x} = x^{7-3} = x^4$

Power of a Quotient Property $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

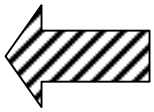
"To find a power of a quotient, find the power of the numerator and the power of the denominator, and divide."

Example: $\left(\dfrac{x^4}{y^3}\right)^2 = \dfrac{(x^4)^2}{(y^3)^2} = \dfrac{x^8}{y^6}$

Rule of Negative and Zero Exponents $a^{-n} = \frac{1}{a^n}$ & $a^0 = 1$

Examples:

a) $x^{-3} = \frac{1}{x^3}$ b) $\frac{1}{y^{-5}} = y^5$ *c*) $5^0 = 1$

d) $\left(\frac{2}{3}\right)^{-3} = \frac{2^{-3}}{3^{-3}} = \frac{3^3}{2^3} = \frac{27}{8}$  ***we used the "Power of a Quotient" property here!"***

or, looking at the same problem another way:

e) $\left(\frac{2}{3}\right)^{-3} = \frac{1}{\left(\frac{2}{3}\right)^3} = \frac{1}{\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)} = \frac{1}{\frac{8}{27}} = 1 \div \frac{8}{27} = 1 \cdot \frac{27}{8} = \frac{27}{8}$

… in other words, algebra fans… $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$ (talk about a flip-flop!)

*Simplify the following expressions using **positive exponents**.*

1. 5^{-2}

2. x^{-6}

3. $\dfrac{1}{y^{-4}}$

4. $\dfrac{3x^{-5}}{4y^{-3}}$

5. $(17)^{3} \cdot (17)^{-2}$

6. $\left(\dfrac{3}{4}\right)^{-3}$

7. $\left(\dfrac{2x^{2}y}{3xy^{3}}\right)^{2}$

8. $\left(\frac{w^4x^2y}{xy^3}\right)^3$

9. $\frac{c^3}{c^{-3}}$

10. $(-4x^2y^4)^{-1} \cdot (2xy^2)^2$