Name: _____ Date: _____ Hour: _____

Unit 5 Day 4: The Quotient Rule of Exponents

*Focus Question: How do you **divide** when powers have the same base?*

A. 1. Write each of the following in expanded form. Then write the answer in exponential form with a single base and power.

Problem	Expanded form	Single base and power
Example: $\frac{2^6}{2^4}$	$\frac{2\cdot2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot2} = \frac{2^2}{1}$	2^2
a) $\frac{3^5}{3^2}$		
b) $5^7 \div 5^1$	$\frac{5\cdot5\cdot5\cdot5\cdot5\cdot5\cdot5}{5} = \frac{5^6}{1}$	5^6
c) $\frac{x^9}{x^4}$	$\frac{x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x}{x\cdot x\cdot x\cdot x} = \frac{x^5}{1}$	x^5
d) $y^4 \div y^1$		y^3
e) $\frac{a^7}{a^2}$		a^5

2. Finish the following equation to express the **Quotient Rule of Exponent** (assume a≠0)

$$\frac{a^m}{a^n} = a^{m-n}$$

(m−n: Subtract; a: same base)

3. Why can the base not equal zero? (ie. $\frac{0^3}{0^2}$)

4. Explain **when** you can use the quotient rule? the same base is being divided

B. **1. Practice showing work but not writing expanded form.**

Problem	Work	Exponential Form
$\frac{7^8}{7^2}$	7^{8-2}	7^6
$4^3 \div 4^{-7}$	4^{3--7}	4^{10}
$\frac{x^9}{x^3}$	x^{9-3}	x^6
$m^1 \div m^{-7}$	m^{1--7}	m^8

$\frac{b^{20}}{b^4}$	b^{20-4}	b^{16}

If you ever forget the shortcut…use expanded form.

2. Challenge Problems

Simplify each expression or put numbers in the box to make the equation true.

a. $\frac{x^{-1}}{x^{-8}}$ $x^{-1--8} = x^{7}$

b. $\frac{6^5}{6^3}$ $6^{5-3} = 6^2$

c. $\frac{h^{\boxed{18}}}{h^4} = h^{\boxed{14}}$

d. $\frac{24x^6}{12x^{-8}}$ $\frac{24}{12} x^{6--8}$ $\boxed{2x^{14}}$

e. $\frac{6x^7}{2x^4}$ $\boxed{3x^3}$

f. $\frac{10k^{\boxed{6}}}{2k^3} = 5k^3$

g. $\frac{8x^5}{4x^2}$ $\boxed{2x^3}$

h. $\frac{x^5y^6}{xy^2}$ $x^{5-1}\ y^{6-2}$ $\boxed{x^4y^4}$

i. $\frac{18x^5y^3}{6x^2y^2}$ $\frac{18}{6} x^{5-2}\ y^{3-2}$ $\boxed{3x^3y^1}$

j. $\frac{10^{\boxed{12}}}{10^4} = \boxed{10}^8$