CW 4.2.4 Properties of Exponents Name _____

Exploring Rules of Exponents: How can you use patterns to discover rules for multiplying with exponents?

$\frac{4}{4}=1$; $\frac{7}{7}=1$; $\frac{x}{x}=1$

Expression	Expanded form	Product as a power
$\frac{4^5}{4^3}$	$\frac{4\cdot4\cdot4\cdot4\cdot4}{4\cdot4\cdot4}$	4^2
$\frac{7^9}{7^5}$	$\frac{7\cdot7\cdot7\cdot7\cdot7\cdot7\cdot7\cdot7\cdot7}{7\cdot7\cdot7\cdot7\cdot7}$	7^4
$\frac{x^8}{x^3}$	$\frac{x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x}{x\cdot x\cdot x}$	x^5

Division Properties of Exponents:

Quotient of Powers Property:

To divide powers having the same base, subtract exponents.

$$\frac{a^m}{a^n} = a^{m-n}, \quad a \neq 0$$

Example:

$\frac{3^7}{3^5} = 3^{7-5} = 3^2$ 9

Examples:

1. $\frac{x^{12}}{x^9}$ x^{12-9} x^3

2. $\frac{p^7r^5}{p^4r^2}$ $\frac{p^7}{p^4}\frac{r^5}{r^2}$ p^3r^3

3. $\frac{9^{15}}{9^7}$ $(15-7)$ 9^8

4. $\frac{8\bullet10^6}{2\bullet10^3}$ $\frac{8}{2}\cdot\frac{10^6}{10^3}$ $4\cdot10^3$

Examples:

5. $\frac{16x^5y^7}{8x^3y^5}$ $\frac{16}{8}\frac{x^5}{x^3}\frac{y^7}{y^5}$ $2x^2y^2$

6. $\frac{36x^{12}y^8}{2x^4y}$ $\frac{36}{2}\frac{x^{12}}{x^4}\frac{y^8}{y^1}$ $18x^8y^7$

7. $\frac{-18p^4q^9r^7}{6p^2r^5}$ $\frac{-18}{6}\frac{p^4}{p^2}q^9\frac{r^7}{r^5}$ $-3p^2q^9r^2$

8. $\frac{24x^{13}y^{10}}{9x^5y}$ $\frac{24}{9}\frac{x^{13}}{x^5}\frac{y^{10}}{y^1}$ $\frac{8x^8y^9}{3}$