CW 4.2.5 Properties of Exponents Name _____

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

Expression	Expanded form	Product as a power
$\left(\frac{2}{5}\right)^4$	$\left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right)$	$\frac{2^4}{5^4}$
$\left(\frac{3}{2}\right)^3$	$\left(\frac{3}{2}\right)\left(\frac{3}{2}\right)\left(\frac{3}{2}\right)$	$\frac{3^3}{2^3}$
$\left(\frac{x^2}{2}\right)^3$	$\left(\frac{x^2}{2}\right)\left(\frac{x^2}{2}\right)\left(\frac{x^2}{2}\right)$	$\frac{(x^2)^3}{2^3} = \frac{x^6}{2^3}$

Power of a Quotient Property

To find a power of a quotient, find the power of the numerator and the power of the denominator and simplify, if possible.

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m} \qquad \left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4} = \frac{16}{81}$$

Examples: Evaluate the expression. Write fractions in simplest form.

1) $\left(\frac{1}{2}\right)^5$ $\frac{1^5}{2^5} = \frac{1}{32}$

2) $\left(\frac{2}{3}\right)^2$ $\frac{2^2}{3^2} = \frac{4}{9}$

3) $\left(\frac{3}{8}\right)^{-1}$ $\frac{3^{-1}}{8^{-1}} = \frac{8}{3}$

4) $\left(\frac{7}{4}\right)^{-3}$ $\frac{7^{-3}}{4^{-3}} = \frac{4^3}{7^3} = 64/343$

5) $\left(\frac{3}{y}\right)^3$ $\frac{3^3}{y^3} = \frac{27}{y^3}$

6) $\left(\frac{a^6}{2b^8}\right)^5$ $\frac{(a^6)^5}{2^5(b^8)^5} = \frac{a^{30}}{32b^{40}}$

7) $\left(\frac{-2}{m}\right)^{-4}$ $\frac{(-2)^{-4}}{m^{-4}}$ $\frac{m^4}{(-2)^4} = \frac{m^4}{16}$

8) $\left(\frac{x^4}{2^3}\right)^{-2}$ $\frac{x^{-8}}{2^{-6}} = \frac{2^6}{x^8}$

9) $\left(\frac{3x^2}{y}\right)^3$ $\frac{3^3(x^2)^3}{y^3} = \frac{27x^6}{y^3}$

10) $\left(a^2b^{-3}\right)^6$ $\left(\frac{a^2}{b^3}\right)^6 = \frac{a^{12}}{b^{18}}$

11) $\left(x^2y^{-3}z^4\right)^3$ $\left(\frac{x^2z^4}{y^3}\right)^3 = \frac{x^6z^{12}}{y^9}$

12) $\left(\frac{x^2y}{-2xy^3}\right)^2$ $\frac{x^4y^2}{4x^2y^6} = \frac{x^2y^{-4}}{4} = \frac{x^2}{4y^4}$

13) $\left(\frac{2x^{-3}}{y^2}\right)^{-4}$ $\frac{2^{-4}x^{12}}{y^{-8}} = \frac{x^{12}y^8}{2^4} = \frac{x^{12}y^8}{16}$