Objective: 1.01 Exponent Properties

Zero Exponents and Negative Exponents

Zero Exponents: ANYTHING TO THE ZERO POWER IS ONE (except zero)!!!!

Negative Exponents: $a^{-n} = \frac{1}{a^n}$ If there is a negative exponent in the denominator, you can make it positive by moving it to the numerator. If there is a negative exponent in the numerator, you make it positive by moving it to the denominator.

Examples:

a. $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

b. $(100)^0 = 1$

c. $2x^{-2}y^{-4}z$ *The x and y both have negative exponents, they both go to the denominator. 2 and z stay in the numerator* = $\frac{2z}{x^2 y^4}$

d. $\frac{8d^{-1}}{4ce^{-2}} =$ Divide 8 and 4, move the d to the denominator. The e needs to move to the numerator. The c stays on the bottom because it doesn't have a negative exponent. The final answer is $\frac{2e^2}{cd}$

Try these:

1. $x^{-2}y$

2. $\frac{6a^{-9}b^{-3}c}{2de^{-1}f^{-4}}$

3. 8^0

4. $9h^{-1}j^2k^{-8}$

Answers: 1. $\frac{y}{x^2}$ 2. $\frac{3cef^4}{a^9b^3d}$ 3. 1 4. $\frac{9j^2}{hk^8}$

Division Properties of Exponents:

Dividing Powers with the same base

$\frac{a^m}{a^n} = a^{m-n}$ When your bases are the same you SUBTRACT the exponents.

Examples:

a. $\frac{x^3}{x} = x^{3-1} = x^2$

b. $\frac{a^2b^3c}{abc} = a^{2-1} \bullet b^{3-1} \bullet c^{1-1} = ab^2$ (remember $c^0=1$)

c. $\frac{qr^{-2}s^4}{q^{-1}r^2s^3} = q^{1-(-1)}r^{-2-(2)}s^{4-3} = q^2r^{-4}s = \frac{q^2s}{r^4}$

Try These:

1. $\frac{j^{12}}{j^6}$ 2. $\frac{w^{-4}xy^7}{wx^2y^5}$ 3. $\frac{lm^3n^{-3}p^2}{m^{-2}n^2p^7q}$

Answers: 1. j^6 2. $\frac{y^2}{w^5x}$ 3. $\frac{lm^5}{n^5p^5q}$

Raising a quotient to a power

$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ When there is a fraction raised to a power, you raise both the numerator and denominator to the power.

Examples:

a. $\left(\frac{x}{y}\right)^2 = \frac{x^2}{y^2}$

b. $\left(\frac{a^2b}{c^3}\right)^3 = \left(\frac{a^{2*3}b^3}{c^{3*3}}\right) = \frac{a^6b^3}{c^9}$ *Remember when there is a power raised to a power, you have to multiply!

c. $\left(\frac{2k^{-2}l^4}{3kl^2}\right)^2$ = *Simplify the inside first, then raise everything to the second power.

$=\left(\frac{2l^2}{3k^3}\right)^2 = \left(\frac{2^2 l^{2*2}}{3^2 k^{3*2}}\right) = \frac{4l^4}{9k^6}$

d. $\left(\frac{2x^2}{y^4}\right)^{-3} = \left(\frac{2^{-3}x^{-6}}{y^{-12}}\right) = \left(\frac{y^{12}}{2^3 x^6}\right) = \frac{y^{12}}{8x^6}$

You try:

1. $\left(\frac{d^2}{c}\right)^2$ 2. $\left(\frac{abc}{d}\right)^2$ 3. $\left(\frac{3e^{-2}f^3g^4}{2ef^{-1}g^3}\right)^3$ 4. $\left(\frac{rs^5}{t^2}\right)^{-5}$ 5. $\left(\frac{2w^{-2}x^{-1}y}{w^2x^2}\right)^{-3}$

Answers: 1. $\frac{d^4}{c^2}$ 2. $\frac{a^2b^2c^2}{d^2}$ 3. $\frac{27f^{12}g^3}{8e^9}$ 4. $\frac{t^{10}}{r^5s^{25}}$ 5. $\frac{w^{12}x^9}{8y^3}$