Exponent Rules OR Exponents Rule!

Laws of exponents for real numbers a and b and integers m and n:

Rule	Example	Rule	Example
$a^m \cdot a^n = a^{m+n}$	$5^2 \cdot 5^4 = 5^6$	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4} = \frac{16}{81}$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{x^{12}}{x^4} = x^8$	$a^{-n} = \frac{1}{a^n}$	$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$
$a^0 = 1$	$10^0 = 1$	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$	$\left(\frac{2}{3}\right)^{-4} = \left(\frac{3}{2}\right)^4 = \frac{3^4}{2^4} = \frac{81}{16}$
$(a \cdot b)^n = a^n \cdot b^n$	$(5x)^2 = 5^2 \cdot x^2 = 25x^2$		
$(a^m)^n = a^{m \cdot n}$	$(3^2)^4 = 3^8$	$\frac{1}{a^{-n}} = a^n$	$\frac{1}{x^{-2}} = x^2$

NOTE: These exercises involve the first five rules involving whole number exponents.

1. Evaluate the following expressions. Show the exponent meaning in your work.

(a) 2^3 (b) $(-4)^2$ (c) $(-6)^0$

(d) $3 \cdot 4^2$ (e) $\left(\frac{3}{2}\right)^3$ (f) $\left(\frac{1}{4}\right)^{-2}$

2. Evaluate each expression for the given value of x. Show the substitution and each "order of operation step toward the solution.

(a) $2x^2$; x = 5 (b) $(2x)^2$; x = 5 (c) $\frac{x^4}{4}$; x = - 2 (d) $5 - 2x^2$; x = -3

3. True or False. Explain your reasoning. $(-3)^4 = -3^4$ _____

4. Simplify. Use only positive exponents in your answers. Show the exponent rules steps.

(a) $x^5 \cdot x^3 \cdot x^2$ (b) $\frac{y^{10}}{y}$ (c) $\left(\frac{x}{3}\right)^2$

(d) $(-4xy^3)^2$ (e) $(b^2)^3$ (f) $\frac{-24x^2y^6z}{-3x^2y^4z^3}$

5. Make up three problems of your own, and show correct use of the exponent rules toward the solution.

(a)

(b)

(c)

Do your best! Rise to the challenge! Live and learn!