6.2 Working With Integer Exponents

Investigate: Using patterns to evaluate powers. No decimals.
Complete the statements below and then describe the pattern.

$2^5 = 32$
$2^4 = 16$ ÷ 2
$2^3 = 8$ ÷ 2
$2^2 = 4$ ÷ 2
$2^1 = 2$
$2^0 = 1$
$2^{-1} = \frac{1}{2}$
$2^{-2} = \frac{1}{4}$ $\left(\frac{1}{2^2}\right)$

$3^3 = 27$
$3^2 = 9$ ÷ 3
$3^1 = 3$ ÷ 3
$3^0 = 1$
$3^{-1} = \frac{1}{3}$
$3^{-2} = \frac{1}{9}$ $\left(\frac{1}{3^2}\right)$

positive ,zero and negative exponents all follow a pattern

note your BASE cannot be 0

Zero Exponent

In General:

$$a^0 = 1$$

Negative Exponent:

In General:

$$a^{-n} = \frac{1}{a^n}$$

In Words:

Invert the base and put to a positive exponent

Extend the rule:

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$$

$$= \frac{b^n}{a^n}$$

Practice time....

Evaluate (Leave answers in fractional form):

a) $2^0 = 1$ b) $(-2)^4 = 16$ c) $-2^4 = -16$ d) $(-3)^5 = -243$

e) $2^{-4} = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$ f) $-2^{-4} = -\frac{1}{16}$ g) $-3^0 = -1$ h) $3^{-2} = \frac{1}{9}$

Simplify:(write as a single power with positive exponents)

a) $\left((4^3)^{-2}\right)^{-1}$

$= 4^{3(-2)(-1)}$

$= 4^6$

b) $\frac{\left((3^{-1})^{-2}\right)^{-1}}{3(3)^2}$

$= \frac{3^{(-1)(-2)(-1)}}{3^{1+2}}$

$= \frac{3^{-2}}{3^3}$

$= 3^{-2-3}$

$= 3^{-5}$

$= \frac{1}{3^5}$

$= \frac{1}{3^3 \cdot 3^2}$

$= \frac{1}{3^5}$

c) $\left(\frac{(4^3)^2}{4(4^6)}\right)^{-1}$

$= \left(\frac{4^6}{4^7}\right)^{-1}$

$= (4^{-1})^{-1}$

$= 4$

Simplify: answer should positive exponents; leave in fractional form

a) $5^{-4}\left(5^{-2}\right)^{-1}$

$= 5^{-4} \cdot 5^{2}$

$= 5^{-2}$

$= \frac{1}{5^2}$

b) $\left(\frac{2}{5}\right)^{-3} \times \left(\frac{2}{5}\right)^{4} \div \left(\frac{2}{5}\right)^{13}$

$= \left(\frac{2}{5}\right)^{-3+4-13}$

$= \left(\frac{2}{5}\right)^{-12}$

$= \left(\frac{5}{2}\right)^{12}$

$= \frac{5^{12}}{2^{12}}$

Evaluate:

a) $3^{-2} - 2^{-3}$ NOT LIKE BASES!!!

NORMAL SUBTRACTION

$= \frac{1}{9} - \frac{1}{8}$

$= \frac{8}{72} - \frac{9}{72}$

$= -\frac{1}{72}$

b) $\left(\frac{1}{2}\right)^{-3} + \left(\frac{1}{4}\right)^{-1} - 5^{0}$

$= \left(\frac{2}{1}\right)^{3} + \left(\frac{4}{1}\right)^{1} - 1$

$= 2^3 + 4 - 1$

$= 8 + 4 - 1$

$= 11$

Determine the value of the variable that make each of the following true:

a) $10^x = 10000000$

$10^x = 10^7$

$\therefore x = 7$

Hint: count the zeros

b) $3^n = \frac{1}{3}$

$3^n = (3)^{-1}$

$\therefore n = -1$

c) $10^y = 0.00000001$

$10^y = \left(\frac{1}{10}\right)^8$

$10^y = 10^{-8}$

$\therefore y = -8$

Hint: small number you need a neg exponent

d) $8^m = \frac{1}{64}$

$8^m = \frac{1}{8^2}$

$8^m = 8^{-2}$

$\therefore m = -2$

Simplify each expression, answer with positive exponents

a) $\dfrac{y^{4}\left(x^{2}\right)^{-3}y^{3}}{x^{-5}\left(y^{-4}\right)^{2}}$

$= \dfrac{y^{-4}\,x^{-6}\,y^{-3}}{x^{-5}\,y^{-8}}$

$= \dfrac{x^{5}y^{8}}{y^{4}x^{6}y^{3}}$

$= \dfrac{x^{5}y^{8}}{x^{6}y^{7}}$

$= x^{5-6}y^{8-7}$

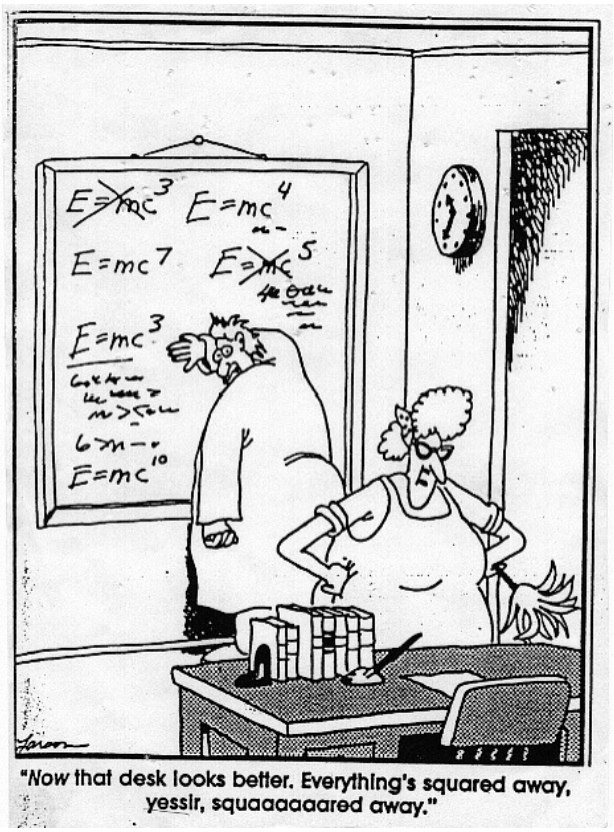
$= x^{-1}y^{1}$

$= \dfrac{y}{x}$

$\frac{1}{x}\cdot y = \frac{y}{x}$

b) $\dfrac{x^{-3}\left(y^{-1}\right)^{-2}}{\left(x^{-5}\right)\left(y^{4}\right)}$

Hmwk:
p 408 # 4, 5 cdef,
6, 7, 9, 11 adf, 12, 13



"Now that desk looks better. Everything's squared away, yessir, squaaaaaared away."