Sec. 7.1 Zero and Negative Exponents

$a^0 = 1$

$3^{-2}\ 3^{-1}\ 3^0\ 3^1\ 3^2\ 3^3\ 3^4$

$\frac{1}{9}\ \frac{1}{3}\ 1\ 3\ 9\ 27\ 81$

$\div 3\ \div 3\ \div 3\ \div 3\ \div 3$

$\frac{1}{3} \div 3$

$\frac{1}{3} \cdot \frac{1}{3} = \frac{1}{9}$

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

Problem 1: Simplify

a. $6^{-2} = \frac{1}{6^2} = \frac{1}{36}$

b. $(-9.3)^0 = 1$

Problem 2: Simplify

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

b. $\frac{1}{x^{-6}} = x^6$ $\quad \frac{1}{\frac{1}{x^6}} = 1 \cdot \frac{x^6}{1} = x^6$

c. $\frac{4^1}{a^{-3}} = 4a^3$

d. $\frac{n^{-5}}{m^2} = \frac{1}{m^2 n^5}$

Problem 3:

What is the value of $2a^{-2}b^4$ for $a=-2$ and $b=1$?

$2a^{-2}b^4$ $\qquad$ $2(-2)^{-2}(1)^4$

$\frac{2b^4}{a^2} = \frac{2(1)^4}{(-2)^2} = \frac{2\cdot 1}{4}$ $\qquad$ $\frac{2(1)^4}{(-2)^2} = \frac{2\cdot 1}{4}$

$\boxed{\frac{1}{2}}$ $\qquad$ $\boxed{\frac{1}{2}}$

b. $n=-2,\ w=5$

$n^{-4}w^0 = \frac{w^0}{n^4} = \frac{1}{n^4} = \frac{1}{(-2)^4} = \frac{1}{16}$

* $-3^0 = -1 \cdot 3^0 = -1 \cdot 1 = -1$

$(-3)^0 = 1$

Problem 4: The expression $6400 \cdot 2^t$ models a population of 6400 birds after t periods of 8 years. (The population of the birds doubles every 8 years.)
Evaluate the expression for $t = 0$ and $t = -2$.

$6400 \cdot 2^t$

$6400 \cdot 2^0 = 6400 \cdot 1 = 6400$

$6400 \cdot 2^{-2} = 6400 \cdot \frac{1}{2^2}$

$= 6400 \cdot \frac{1}{4} = 1600$