Sec. 7.4 Division Properties of Exponents

$$\frac{a^m}{a^n} = a^{m-n}$$ subtract the exponents

$$\frac{a^7}{a^4} = \frac{a\cdot a\cdot a\cdot a\cdot a\cdot a\cdot a}{a\cdot a\cdot a\cdot a} = a^3$$

a^{7-4}

Problem 1: Simplify

a. $\frac{c^{\frac{12}{5}}}{c^2} = c^{\frac{12}{5}-\frac{2}{1}\cdot\frac{5}{5}} = c^{\frac{12}{5}-\frac{10}{5}} = c^{\frac{2}{5}}$

b. $\frac{a^4b^8}{a^6b^3} = a^{4-6}b^{8-3} = a^{-2}b^5 = \frac{b^5}{a^2}$

$\frac{aaaa}{a\cdot aaaaaa}$ $\frac{b^{8-3}}{a^{6-4}} = \frac{b^5}{a^2}$

c. $\frac{2m^4n^3p^{-3}}{5m^{-2}n^7p^{-8}} = \frac{2m^{4-(-2)}n^{3-7}p^{-3-(-8)}}{5}$

$\downarrow$

$\frac{2m^4m^2n^{-4}p^5}{5}$ $\frac{2m^6n^{-4}p^5}{5} = \frac{2m^6p^5}{5n^4}$

$\frac{2m^4m^2n^{-4}p^5}{5n^7p^3}$

$\frac{2m^6p^5}{5n^4}$

Problem 2:

populations: Pennsylvania 1.24×10^7 North Dakota 6.4×10^5

About how many times greater is the population of Pennsylvania than North Dakota?

$$\frac{1.24 \times 10^7}{6.4 \times 10^5} = 0.19375 \times 10^2$$

$$1.9375 \times 10^1$$

$$19.375$$

about 19 times greater

Power of a Quotient: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

$\left(\frac{a}{b}\right)^{-1} = \frac{1}{\frac{a}{b}}$ $1 \div \frac{a}{b}$ $1 \cdot \frac{b}{a} = \boxed{\frac{b}{a}}$ $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$

Problem 3: Simplify $\frac{a^{-n}}{b^{-n}} = \frac{b^n}{a^n}$

a. $\left(\frac{w^5}{4}\right)^3 = \frac{(w^5)^3}{4^3} = \frac{w^{15}}{64}$

b. $\left(\frac{z^{\frac{2}{3}}}{5}\right)^3 = \frac{(z^{\frac{2}{3}})^3}{5^3} = \frac{z^2}{125}$

Problem 4: Simplify

a. $\left(\frac{3c^3}{d^2}\right)^{-4} = \left(\frac{d^2}{3c^3}\right)^4 = \frac{(d^2)^4}{3^4(c^3)^4} = \frac{d^8}{81c^{12}}$

$\downarrow$

$\frac{3^{-4}(c^3)^{-4}}{(d^2)^{-4}} = \frac{3^{-4}c^{-12}}{d^{-8}}$

$= \frac{d^8}{3^4c^{12}} = \frac{d^8}{81c^{12}}$