Date: _____

4.4 Fractional Exponents and Radicals – Part 2

$x^{\frac{m}{n}} = \sqrt[n]{x^m}$ DENOMINATOR ⇔ INDEX

Examples: ***Write each radical as a power.***

a) $\sqrt{3^5} = 3^{\frac{5}{2}}$

c) $\sqrt[3]{19^4} = 19^{\frac{4}{3}}$

b) $\sqrt[3]{25^2} = 25^{\frac{2}{3}}$

d) $\sqrt{\left(\frac{2}{5}\right)^7} = \left(\frac{2}{5}\right)^{\frac{7}{2}}$

Examples: ***Write each power as a radical and evaluate.***

a) $\left(\frac{4}{9}\right)^{\frac{1}{2}} = \sqrt[2]{\left(\frac{4}{9}\right)^1} = \sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$

power — radical

d) $16^{0.75} = 16^{\frac{3}{4}} = \left(\sqrt[4]{16}\right)^3 = 2^3 = 8$

$\frac{75}{100} \div 25$

b) $0.49^{\frac{1}{2}} = \sqrt{0.49} = 0.7$

split decimal place in half

e) $\left(\frac{4}{25}\right)^{\frac{3}{2}} = \left(\sqrt{\frac{4}{25}}\right)^3 = \left(\frac{2}{5}\right)^3 = \frac{2^3}{5^3} = \frac{8}{125}$

c) $\left(\frac{16}{81}\right)^{\frac{1}{4}} = \sqrt[4]{\frac{16}{81}} = \frac{\sqrt[4]{16}}{\sqrt[4]{81}} = \frac{2}{3}$

f) $0.04^{\frac{3}{2}} = \left(\sqrt{0.04}\right)^3 = (0.2)^3 = (0.2)(0.2)(0.2) = 0.008$

Example 3: ***Write as a power with exponent*** $\frac{1}{2}$ ***and then write as a radical.***

a) $4 = 16^{\frac{1}{2}} = \sqrt{16}$

b) $5 = 25^{\frac{1}{2}} = \sqrt{25}$

Example 3: ***Write as a power with exponent*** $\frac{1}{3}$ ***and then write as a radical.***

a) $2 = 8^{\frac{1}{3}} = \sqrt[3]{8}$

↑ standard form ↑ exponential form ↑ radical form

b) $-4 = -64^{\frac{1}{3}} = \sqrt[3]{-64}$

Example 4:

Brain mass can be estimated with the formula:

$$b = 0.01m^{\frac{2}{3}}$$

where *b* is the brain mass (in kg) and *m* is the body mass (in kg).

Estimate the brain mass of each animal.

a) husky 27 kg

$b = 0.01(27)^{\frac{2}{3}}$
$= 0.01(\sqrt[3]{27})^2$
$= 0.01(3)^2$
$= 0.01(9)$
$= 0.09$ kg

b) polar bear 200 kg

$b = 0.01(200)^{\frac{2}{3}}$
$= 0.01(\sqrt[3]{200})^2$ * USE CALC.
$= 0.01(34)$ ← rounded to whole #
$= 0.34$ kg

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