HAT
Operations with Radical Expressions

11/1/17

$$\left(\sqrt{\dfrac{1}{\sqrt{x}}}\right)^2 = 3,\right)^2 \quad x = ?$$

$$\sqrt{\dfrac{1}{\sqrt{x}}} = 3$$

$$\dfrac{\sqrt{x}}{9} \cdot \dfrac{1}{\sqrt{x}} = 9 \cdot \dfrac{\sqrt{x}}{9}$$

$$\dfrac{1}{\sqrt{\sqrt{x}}} = 3$$

$$2^{-2} = \dfrac{1}{2^2}$$

$$x^{-2} = \dfrac{1}{x^2}$$

$$\dfrac{1}{9}^2 = \sqrt{x}^2$$

$$\left(\dfrac{1}{\sqrt[4]{x}}\right)^4 = (3)^4$$

$$x^{\frac{1}{3}} = \sqrt[3]{x}$$

$$\dfrac{1}{81} = x$$

$$\dfrac{1}{x} = 81$$

$$x = \dfrac{1}{81}$$

Warm Up: Simplify

a) $\sqrt{32x^8}$

$\sqrt{2 \cdot 16 \cdot x^8}$

$4x^4\sqrt{2}$

b) $\sqrt[4]{16a^{24}b^{13}}$

$2a^6b^3\sqrt[4]{b}$

Product Property of Radicals:
For any real numbers a and b and any integer $n > 1$

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

if n is even and a and b are both nonnegative
or if n is odd.

*Rationalizing the denominator

Ex#1: Simplify

a) $\sqrt{\dfrac{x^6}{y^7}}$

b) $\sqrt[3]{\dfrac{2}{9x}}$

$\dfrac{\sqrt{x^6}}{\sqrt{y^7}}$

$\dfrac{|x^3|}{y^3\sqrt{y}} \cdot \dfrac{\sqrt{y}}{\sqrt{y}} = \boxed{\dfrac{x^3\sqrt{y}}{y^4}}$

$\dfrac{\sqrt[3]{2}}{\sqrt[3]{9x}}$

$\dfrac{\sqrt[3]{2}}{\sqrt[3]{3^2 \cdot x}} \cdot \dfrac{\sqrt[3]{3x^2}}{\sqrt[3]{3x^2}} = \dfrac{\sqrt[3]{6x^2}}{3x}$

Quotient Property of Radicals:
For any real numbers a and $b \neq 0$ and any integer $n > 1$

$$\sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

if all roots are defined.

A radical expression is in simplified form when these conditions are met:

- The index n is as small as possible.
- The radicand contains no factors (other than 1) that are nth powers of an integer or polynomial.
- The radicand contains no fractions.
- No radicals appear in a denominator.

Ex#2: Simplify $2\sqrt[4]{8x^3y^2} \cdot 3\sqrt[4]{2x^5y^2}$

$6\sqrt[4]{16x^8y^4}$

$4 \cdot 2$

$\boxed{12x^2|y|}$

*   Like Radical Expressions

Ex#3: Simplify $5\sqrt{12} + 2\sqrt{27} - \sqrt{128}$

$5\sqrt{4\cdot3}$ $\sqrt{64\cdot2}$

$10\sqrt{3} + 6\sqrt{3} - 8\sqrt{2}$

$16\sqrt{3} - 8\sqrt{2}$

Ex#4: Simplify $\left(7\sqrt{2}-\sqrt{27}\right)\left(7\sqrt{2}+3\sqrt{3}\right)$

$$\left(7\sqrt{2}-3\sqrt{3}\right)\left(7\sqrt{2}+3\sqrt{3}\right)$$

$$\left(\left(7\sqrt{2}\right)^2 - \left(3\sqrt{3}\right)^2\right)$$

$$98 \quad -27$$

$$\boxed{71}$$

* Conjugate, Rationalize Denominator

Ex#5: Simplify $\dfrac{a}{a\sqrt{2}-a}$

$$\dfrac{a \cdot 1}{a(\sqrt{2}-1)}$$

$$\dfrac{1}{\sqrt{2}-1} \cdot \dfrac{\sqrt{2}+1}{\sqrt{2}+1}$$

$\sqrt{2}^{2}$ 1^{2}

$$\dfrac{\sqrt{2}+1}{2-1}$$

$$\boxed{\sqrt{2}+1}$$

Assignment: page 419 #23, 24, 25, 27, 29, 31,
                            45, 46, 49 - 52, 55 - 58