Name ______________________ Class ____________ Date ____________

# 7-5 Reteaching

## Rational Exponents and Radicals

**When you understand the equivalence of radicals and rational exponents, you can represent a radical expression using rational exponents.**

**If the *n*th root of *a* is a real number and *m* and *n* are positive integers, then**

$$a^{\frac{1}{n}} = \sqrt[n]{a} \text{ and } a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

**You can also represent an expression with rational exponents as a radical expression. Sometimes converting from one form to the other makes it easier to simplify an expression involving roots.**

### Problem

**What is $8^{\frac{3}{2}}$ in radical form? Simplify, if possible.**

$8^{\frac{2}{3}} = \sqrt[3]{8^2}$ Rewrite the expression in radical form.

$= \sqrt[3]{8^2} = \sqrt[3]{64} = \sqrt[3]{4 \cdot 4 \cdot 4} = 4$ Simplify.

**Write each expression in radical form, then simplify if possible.**

**1.** $36^{\frac{1}{2}}$ $\sqrt{36}$; 6

**2.** $4^{\frac{5}{2}}$ $\sqrt{4^5}$; 32

**3.** $(27x)^{\frac{2}{3}}$ $\sqrt[3]{(27x)^2}$; $9\sqrt[3]{x^2}$

**4.** $18b^{\frac{5}{3}}$ $18\sqrt[3]{b^5}$

### Problem

**What is $\sqrt[4]{(16x)^3}$ in exponential form? Simplify, if possible.**

$\sqrt[4]{(16x)^3} = (16x)^{\frac{3}{4}}$ Rewrite the expression in exponential form.

$= 16^{\frac{3}{4}}x^{\frac{3}{4}} = 8x^{\frac{3}{4}}$ Simplify.

**Write each expression in exponential form, then simplify if possible.**

**5.** $\sqrt[3]{8^2}$ $8^{\frac{2}{3}}$; 4

**6.** $\sqrt[3]{8x}$ $(8x)^{\frac{1}{3}}$; $2x^{\frac{1}{3}}$

**7.** $\sqrt[3]{64x^7}$ $64^{\frac{1}{3}}x^{\frac{7}{3}}$; $4x^{\frac{7}{3}}$

**8.** $\sqrt[3]{(27x)^2}$ $(27x)^{\frac{2}{3}}$; $9x^{\frac{2}{3}}$

# 7-5 Reteaching (continued)

## Rational Exponents and Radicals

**You can use the properties of exponents to simplify expressions with rational exponents. When simplifying radical expressions, you can combine like terms.**

**Problem**

**What is the simplified form of the expression, $\left(a^{\frac{1}{4}}\right)\left(a^{\frac{1}{4}}\right)$? Use the properties of exponents, and then write the expression in radical form.**

$\left(a^{\frac{1}{4}}\right)\left(a^{\frac{1}{4}}\right) = a^{\frac{1}{4}+\frac{1}{4}} = a^{\frac{1}{2}}$ When multiplying like bases, add the exponents.

$= \sqrt{a}$ Rewrite in radical form.

**Simplify each expression using the properties of exponents, and then write the expression in radical form.**

9. $\left(a^{\frac{2}{3}}\right)\left(a^{\frac{1}{4}}\right)$ $a^{\frac{11}{12}}$; $\sqrt[12]{a^{11}}$

10. $(ab)^{\frac{1}{3}}\left(b^{\frac{1}{2}}\right)$ $a^{\frac{1}{3}}b^{\frac{5}{6}}$; $\sqrt[3]{a}\ \sqrt[6]{b^5}$

11. $\left(5x^{\frac{1}{5}}\right)(x^2)$ $5x^{\frac{11}{5}}$; $5\sqrt[5]{x^{11}}$

12. $(8x)^{\frac{1}{3}}(64x)^{\frac{1}{2}}$ $16x^{\frac{5}{6}}$; $16\sqrt[6]{x^5}$

**Problem**

**What is the exponential form of the expression, $\sqrt{a^3} + 3\sqrt{a^5}$?**

$\sqrt{a^3} + 3\sqrt{a^5} = a^{\frac{3}{2}} + 3a^{\frac{5}{2}}$ Rewrite the expression in exponential form. The expression cannot be simplified further because the terms are not like terms.

**Write each expression in exponential form. Simplify when possible.**

13. $\sqrt[3]{a^2} + 2\sqrt[3]{a^2}$ $3a^{\frac{2}{3}}$

14. $\left(\sqrt{16x^4}\right) + \left(\sqrt[3]{27x^5}\right)$ $4x^2 + 3x^{\frac{5}{3}}$

15. $\sqrt[3]{(27x)^2} + \sqrt[4]{256x^2}$ $9x^{\frac{2}{3}} + 4x^{\frac{1}{2}}$

16. $4\sqrt[3]{(3x)^6} - \sqrt{(2x)^4}$ $32x^2$