Name: KEY Hour: ____________ Date: ____________

NOTES: Section 6.2 – Apply Properties of Rational Exponents

Goals: #1 - I can simplify a numerical expression using properties of radicals and rational exponents.

#2 - I can simplify a variable expression using properties of radicals and rational exponents.

#3 - I can add and subtract expressions with radicals and rational exponents.

Homework: Lesson 6.2 Worksheet

Warm Up:

1. Evaluate the expression without using a calculator.

a. $(\sqrt[4]{81})^4$

$(3)^4$

$\boxed{81}$

b. $4^{5/2}$

$(\sqrt{4})^5$

$(2)^5$

$\boxed{32}$

c. $(-32)^{3/5}$

$(\sqrt[5]{-32})^3$

$(-2)^3$

$\boxed{-8}$

2. Solve the equation. Round your answer to the nearest hundredth.

a. $2x^5 + 73 = 53$

$2x^5 = -20$

$x^5 = -10$

$\sqrt[5]{x^5} = \sqrt[5]{-10}$

$\boxed{x \approx -1.58}$

b. $(x + 3)^4 = 362$

$\sqrt[4]{(x+3)^4} = \sqrt[4]{362}$

$x + 3 = \pm 4.36$

$x = -3 \pm 4.36$

$\boxed{x = 1.36}$ $\boxed{x = -7.36}$

Review:

Recall the properties of exponents:

- $a^m \cdot a^n = a^{\boxed{m+n}}$
- $\dfrac{a^m}{a^n} = a^{\boxed{m-n}}$
- $(a^m)^n = a^{\boxed{m \cdot n}}$
- $(ab)^m = a^{\boxed{m}} b^{\boxed{m}}$
- $\left(\dfrac{a}{b}\right)^m = \dfrac{a^{\boxed{m}}}{b^{\boxed{m}}}$
- $a^{-m} = \dfrac{1}{a^{\boxed{m}}}$

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Example #1: Use the properties of rational exponents to simplify the expression.

a. $7^{1/4} \cdot 7^{1/2}$

$7^{1/4 + 1/2}$

$7^{1/4 + 2/4}$

$\boxed{7^{3/4}}$

b. $(6^{1/2} \cdot 4^{1/3})^2$

$6^{1/2 \cdot 2} \cdot 4^{1/3 \cdot 2}$

$6^1 \cdot 4^{2/3}$

$\boxed{6 \cdot 4^{2/3}}$

c. $\frac{5}{5^{1/3}}$

$5^{1 - 1/3}$

$5^{3/3 - 1/3}$

$\boxed{5^{2/3}}$

d. $\left(\frac{42^{1/3}}{6^{1/3}}\right)^2$

$\left(\left(\frac{42}{6}\right)^{1/3}\right)^2$

$(7^{1/3 \cdot 2})$

$\boxed{7^{2/3}}$

You practice: Use the properties of rational exponents to simplify the expression.

a. $\left(\frac{20^{1/2}}{5^{1/2}}\right)^3$

$\left(\left(\frac{20}{5}\right)^{1/2}\right)^3$

$4^{1/2 \cdot 3}$

$\boxed{4^{3/2}}$

b. $(4^5 \cdot 3^5)^{-1/5}$

$((4 \cdot 3)^5)^{-1/5}$

$12^{5 \cdot -1/5}$

12^{-1}

$\boxed{\frac{1}{12}}$

c. $2^{3/4} \cdot 2^{1/2}$

$2^{3/4 + 1/2}$

$2^{3/4 + 2/4}$

$\boxed{2^{5/4}}$

Review:

Recall the properties of radicals:

- $\sqrt[n]{a \cdot b} = \boxed{\sqrt[n]{a}} \cdot \boxed{\sqrt[n]{b}}$
- $\sqrt[n]{\frac{a}{b}} = \frac{\boxed{\sqrt[n]{a}}}{\boxed{\sqrt[n]{b}}}$

Example #2: Use the properties of radicals to simplify the expression.

a. $\sqrt[3]{12} \cdot \sqrt[3]{18}$

$\sqrt[3]{216}$

$\boxed{6}$

b. $\frac{\sqrt[4]{80}}{\sqrt[4]{5}}$

$\sqrt[4]{\frac{80}{5}}$

$\sqrt[4]{16}$

$\boxed{2}$

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Example #3: Write the expression in simplest form.

a. $\sqrt[3]{135}$

$\sqrt[3]{27} \cdot \sqrt[3]{5}$

$\boxed{3\sqrt[3]{5}}$

b. $\frac{\sqrt[5]{7}}{\sqrt[5]{8}} \cdot \frac{\sqrt[5]{4}}{\sqrt[5]{4}}$ → make denom. a perfect 5^{th} power

$\frac{\sqrt[5]{28}}{\sqrt[5]{32}}$

$\boxed{\frac{\sqrt[5]{28}}{2}}$

You practice: Write the expression in simplest form.

a. $\sqrt[4]{27} \cdot \sqrt[4]{3}$

$\sqrt[4]{81}$

$\boxed{3}$

b. $\frac{\sqrt[3]{250}}{\sqrt[3]{2}}$

$\sqrt[3]{\frac{250}{2}}$

$\sqrt[3]{125}$

$\boxed{5}$

c. $\sqrt[5]{\frac{3}{4}}$

$\frac{\sqrt[5]{3}}{\sqrt[5]{4}} \cdot \frac{\sqrt[5]{8}}{\sqrt[5]{8}}$

$\frac{\sqrt[5]{24}}{\sqrt[5]{32}} = \boxed{\frac{\sqrt[5]{24}}{2}}$

Example #4: Perform the indicated operation. Assume all variables are positive.

a. $1\sqrt[4]{10} + 7\sqrt[4]{10}$

$\boxed{8\sqrt[4]{10}}$

b. $2\left(8^{\frac{1}{5}}\right) + 10\left(8^{\frac{1}{5}}\right)$

$\boxed{12\left(8^{\frac{1}{5}}\right)}$

c. $\sqrt[3]{54} - \sqrt[3]{2}$

$\sqrt[3]{27}\ \sqrt[3]{2}$

$3\sqrt[3]{2} - \sqrt[3]{2}$

$\boxed{2\sqrt[3]{2}}$

You practice: Perform the indicated operation. Assume all variables are positive.

a. $7\sqrt[5]{12} - 1\sqrt[5]{12}$

$\boxed{6\sqrt[5]{12}}$

b. $\sqrt[3]{81} - \sqrt[3]{24}$

$\sqrt[3]{27}\ \sqrt[3]{3}\quad \sqrt[3]{8}\ \sqrt[3]{3}$

$3\sqrt[3]{3} - 2\sqrt[3]{3}$

$\boxed{\sqrt[3]{3}}$

c. $4\left(9^{\frac{2}{3}}\right) + 8\left(9^{\frac{2}{3}}\right)$

$\boxed{12\left(9^{\frac{2}{3}}\right)}$

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Example #5: Write the expression in simplest form. Assume all variables are positive.

a. $\sqrt[3]{64y^6}$

$\sqrt[3]{64y^3\cdot y^3}$

$4\cdot y\cdot y$

$\boxed{4y^2}$

b. $\sqrt[4]{\frac{m^4}{n^8}}$

$\frac{\sqrt[4]{m^4}}{\sqrt[4]{n^4\cdot n^4}}$

$\frac{m}{n\cdot n}$

$\boxed{\frac{m}{n^2}}$

c. $\sqrt[5]{4x^8y^{14}z^5}$

$\sqrt[5]{4x^5\cdot x^3\cdot y^5\cdot y^5\cdot y^4\cdot z^5}$

$x\cdot y\cdot y\cdot z\sqrt[5]{4x^3y^4}$

$\boxed{xy^2z\sqrt[5]{4x^3y^4}}$

d. $\sqrt[3]{\frac{x}{y^8}}$

$\frac{\sqrt[3]{x}}{\sqrt[3]{y^8}}\cdot\frac{\sqrt[3]{y}}{\sqrt[3]{y}}$

$\frac{\sqrt[3]{xy}}{\sqrt[3]{y^9}}=\boxed{\frac{\sqrt[3]{xy}}{y^3}}$

e. $3xy^{1/4}+8xy^{1/4}$

$\boxed{11xy^{1/4}}$

f. $12\sqrt[3]{2z^5}-z\sqrt[3]{54z^2}$

$12\sqrt[3]{2z^3\cdot z^2}-z\sqrt[3]{27}\cdot\sqrt[3]{2z^2}$

$12z\sqrt[3]{2z^2}-3z\sqrt[3]{2z^2}$

$\boxed{9z\sqrt[3]{2z^2}}$

You practice: Write the expression in simplest form. Assume all variables are positive.

a. $(27p^3q^{12})^{1/3}$

$27^{1/3}p^1q^4$

$\sqrt[3]{27}\,pq^4$

$\boxed{3pq^4}$

b. $\frac{14xy^{1/3}}{2x^{3/4}z^{-6}}$

$\frac{7x^{1-3/4}y^{1/3}}{z^{-6}}$

$\boxed{7x^{1/4}y^{1/3}z^6}$

c. $\sqrt[3]{6x^4y^9z^{14}}$

$\sqrt[3]{6x^3\cdot x\cdot y^3\cdot y^3\cdot y^3\cdot z^3\cdot z^3\cdot z^3\cdot z^3\cdot z^2}$

$x\cdot y\cdot y\cdot z\cdot z\cdot z\cdot z\sqrt[3]{6xz^2}$

$\boxed{xy^2z^4\sqrt[3]{6xz^2}}$

d. $\sqrt[7]{\frac{p^8}{q^5}}$

$\frac{\sqrt[7]{p^8}}{\sqrt[7]{q^5}}\cdot\frac{\sqrt[7]{q^2}}{\sqrt[7]{q^2}}$

$\frac{\sqrt[7]{p^8q^2}}{\sqrt[7]{q^7}}=\boxed{\frac{p\sqrt[7]{pq^2}}{q}}$

e. $18\sqrt[3]{u}-11\sqrt[3]{u}$

$\boxed{11\sqrt[3]{u}}$

f. $10\sqrt[4]{5s^7}-s\sqrt[4]{80s^3}$

$10\sqrt[4]{5\cdot s^4\cdot s^3}-s\sqrt[4]{16\cdot 5\cdot s^3}$

$10s\sqrt[4]{5s^3}-2s\sqrt[4]{5s^3}$

$\boxed{8s\sqrt[4]{5s^3}}$

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