Name: ______________________________________ Date: ___________________

FRACTIONAL EXPONENTS REVISITED
COMMON CORE ALGEBRA II

Recall that in Unit #4 we introduced the concept that roots (square roots, cube roots, etcetera) could be represented by **rational or fractional** exponents.

UNIT FRACTION EXPONENTS

For n given as a positive integer: $b^{1/n} = \sqrt[n]{b}$

***Exercise* #1:** Rewrite each expression in the form ax^b where a and b are both rational numbers.

(a) $5\sqrt{x}$ (b) $\dfrac{\sqrt[5]{x}}{4}$ (c) $\dfrac{7}{\sqrt[3]{x}}$ (d) $\dfrac{5}{3\sqrt[10]{x}}$

Recall we can also combine integer powers with roots with the following:

RATIONAL EXPONENT CONNECTION TO ROOTS

For the rational number $\dfrac{m}{n}$, $b^{m/n}$ is equivalent to: $\sqrt[n]{b^m}$ or $\left(\sqrt[n]{b}\right)^m$.

***Exercise* #2:** Rewrite each of the following power/root combinations as a rational exponent in simplest form.

(a) $\sqrt{x^7}$ (b) $\sqrt[4]{x^6}$ (c) $\left(\sqrt{x}\right)^6$ (d) $\left(\sqrt[3]{x}\right)^{10}$

***Exercise* #3:** If $f(x) = 10x^{3/2} - 24x^{-1}$, then which of the following represents the value of $f(4)$? Find the value without the use of a calculator. Show the steps in your calculation.

(1) 36 (3) 54

(2) 48 (4) 74

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***Exercise* #4:** Which of the following is *not* equivalent to $x^{-7/3}$?

(1) $\dfrac{1}{x^{7/3}}$ (3) $\dfrac{1}{\sqrt[3]{x^7}}$

(2) $\dfrac{1}{\sqrt[7]{x^3}}$ (4) $\sqrt[3]{\dfrac{1}{x^7}}$

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Fractional exponents play by the same rules (**properties**) as all other exponents. It is, in fact, these properties that can justify many standard manipulations with square roots (and others). For example, simplifying roots.

***Exercise* #5:** We only consider a square root "simplified" when all of its **perfect square factors** have had their square roots evaluated.

(a) Fill in the exponent property below:

$(ab)^n =$

(b) Rewrite $\sqrt{28}$ in factored form, with one factor being the largest perfect square divisor. Also, write the square root in exponent form.

(c) Simplify $\sqrt{28}$ using (b) and the property from (a).

(d) Generalize: $\sqrt{a \cdot b} =$

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

***Exercise* #6:** Simplify each of the following square roots. Show the manipulations that lead to your answers.

(a) $\sqrt{18x^4}$

(b) $\sqrt{200x^5y^3}$

(c) $\sqrt{147x^9y^4}$

We can extend the simplifying process to include cube roots and higher-order roots by simply extending our thinking.

***Exercise* #7:** Simplify each of the following higher order roots.

(a) $\sqrt[3]{16}$

(b) $\sqrt[3]{108}$

(c) $\sqrt[3]{250}$

(d) $\sqrt[3]{128x^8}$

(e) $\sqrt[4]{162}$

(f) $\sqrt[4]{16x^8}$

(g) $\sqrt[4]{48x^{10}y^5}$

(h) $\sqrt[5]{64x^{12}y^{15}}$

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FRACTIONAL EXPONENTS REVISITED
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Which of the following is equivalent to $x^{5/2}$?

(1) $\frac{5x}{2}$ (3) $\sqrt{x^5}$

(2) $\frac{2x}{5}$ (4) $\sqrt[5]{x^2}$ ________

2. If the expression $\frac{1}{\sqrt{x}}$ was placed in x^a form, then which of the following would be the value of a?

(1) -2 (3) $\frac{1}{2}$

(2) 2 (4) $-\frac{1}{2}$ ________

3. Which of the following is *not* equivalent to $\sqrt{x^9}$?

(1) x^3 (3) $x^{9/2}$

(2) $\left(\sqrt{x}\right)^9$ (4) $x^4\sqrt{x}$ ________

4. The radical expression $\sqrt{50x^5y^3}$ can be rewritten equivalently as

(1) $25xy\sqrt{2xy}$ (3) $5x^2y\sqrt{2xy}$

(2) $5xy\sqrt{xy}$ (4) $10x^2y\sqrt{5xy}$ ________

5. If the function $y=12\sqrt[3]{x}$ was placed in the form $y=ax^b$ then which of the following is the value of $a \cdot b$?

(1) -36 (3) 36

(2) -4 (4) 4 ________

6. Rewrite each of the following expressions without roots by using fractional exponents.

(a) $\sqrt{x}$ (b) $\sqrt[3]{x}$ (c) $\sqrt[7]{x}$ (d) $\sqrt{x^5}$

(e) $\sqrt[3]{x^{11}}$ (f) $\dfrac{1}{\sqrt[4]{x}}$ (g) $\dfrac{1}{\sqrt[3]{x^2}}$ (h) $\dfrac{1}{\sqrt{x^9}}$

7. Rewrite each of the following without the use of fractional or negative exponents by using radicals.

(a) $x^{1/6}$ (b) $x^{1/10}$ (c) $x^{-1/3}$ (d) $x^{-1/5}$

(e) $x^{3/5}$ (f) $x^{-7/2}$ (g) $x^{9/4}$ (h) $x^{-2/11}$

8. Simplify each of the following square roots that contain variables in the radicand.

(a) $\sqrt{8x^9}$ (b) $\sqrt{75x^{16}y^{11}}$ (c) $2x\sqrt{18x^7}$ (d) $3x^2y\sqrt{98x^5y^8}$

9. Express each of the following roots in simplest radical form.

(a) $\sqrt[3]{16x^8}$ (b) $\sqrt[3]{108x^5y^{10}}$ (c) $\sqrt[3]{64x^{12}y^{14}}$ (d) $\sqrt[3]{375x^7y^{11}}$

10. Mikayla was trying to rewrite the expression $25x^{1/2}$ in an equivalent form that is more convenient to use. She incorrectly rewrote it as $5\sqrt{x}$. Explain Mikalya's error.