n^{th} Roots & Rational Exponents

$$base^{\frac{exponent}{root\,(index)}} = \sqrt[root\,(index)]{base^{exponent}}$$

Examples:

$$a^{3/4} = \sqrt[4]{a^3} \text{ or } \left(\sqrt[4]{a}\right)^3$$

$$\sqrt{x} = x^{1/2} \qquad x^{\frac{1}{2}}$$

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1. Rewrite the following in radical form & simplify if possible.

a. $x^{\frac{4}{5}} = \sqrt[5]{x^4} \quad \sqrt[5]{x}^4 \quad (\sqrt[5]{x})^4$

$2^3 = 8$

b. $48^{\frac{2}{3}} = \sqrt[3]{48}^2$
$(\sqrt[3]{8\cdot6})^2 = (2\sqrt[3]{6})^2 = 4\sqrt[3]{6}^2$
$(2\cdot6^{1/3})^2 = 4\cdot6^{2/3}$

c. $(32x)^{\frac{3}{4}} \quad (\sqrt[4]{32x})^3 \qquad 2^4 = 16$
$25^{5/2} \quad (\sqrt[4]{16\cdot2x})^3$
$\sqrt{25}^5 \quad (2\sqrt[4]{2x})^3 = 8\sqrt[4]{2x}^3$
$5^5 =$

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d. $27^{-\frac{4}{3}} = \sqrt[3]{27}^{-4} = 3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

e. $\left(\frac{1}{8}\right)^{-\frac{1}{3}} = (8)^{\frac{1}{3}} = \sqrt[3]{8}^1 = 2$
or
$\sqrt[3]{\frac{1}{8}}^{-1} = \left(\frac{1}{2}\right)^{-1} = 2$

f. $(-27)^{2/3} = \sqrt[3]{-27}^2 \qquad (-3)^3 = -3\cdot-3\cdot-3$
$= (-3)^2$
$= 9$

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2. Simplify the rational exponents using properties of exponents & then rewrite the final answer in radical form.

a. $x^{\frac{1}{5}} \cdot x^{\frac{3}{5}}$
$x^{\frac{1}{5}+\frac{3}{5}}$
$x^{4/5} = \sqrt[5]{x^4}$

b. $\frac{a^{\frac{5}{3}}}{a^{\frac{1}{3}}}$
$a^{\frac{5}{3}-\frac{1}{3}}$
$a^{4/3} = \sqrt[3]{a^4}$
$a\sqrt[3]{a}$
$a\cdot a\cdot a$

c. $\frac{m^{\frac{2}{3}}\cdot m^{-\frac{1}{2}}}{m^{\frac{1}{6}}}$
$\frac{\frac{1}{6}+\frac{1\cdot3}{2\cdot3}}{\frac{1}{6}+\frac{3}{6}}$
$\frac{m^{\frac{2}{3}}}{m^{1/6}m^{1/2}}$
$\frac{m^{2/3}}{m^{4/6}}$
$\frac{m^{4/6}}{m^{4/6}}$
$m^{4/6-4/6}$
$m^0 = 1$

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d. $(p^{\frac{3}{4}})^{\frac{2}{5}}$

$p^{\frac{3}{4}\cdot\frac{2}{5}} = p^{\frac{6}{20}}$

$p^{3/10} = \sqrt[10]{p^3}$

e. $\left(\frac{w^{\frac{1}{6}}}{w^{-\frac{2}{3}}}\right)^2$

$\frac{w^{1/3}}{w^{-4/3}} = w^{1/3+4/3}$

$w^{5/3} = \sqrt[3]{w^5}$

$w\sqrt[3]{w^2}$

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3. Rewrite the following radicals using rational exponents.

a. $\sqrt[9]{p^3}$
$p^{3/9} = p^{1/3}$

b. $\left(\sqrt[4]{5a}\right)^3$
$(5a)^{3/4}$

c. $\sqrt[5]{(2x)^{10}}$
$(2x)^2 \text{ or } 4x^2$

d. $\sqrt[2]{27x^3y^1}$
$(27x^3y)^{1/2}$
or $27^{1/2}x^{3/2}y^{1/2}$

HW: p.4-6 omit #44-45 $3^5 = 243$

31. $\sqrt[5]{27x} \cdot \sqrt[5]{9x^4}$

$\sqrt[5]{243x^5} = 3x$

$2^2 = 4$	$2^3 = 8$
$3^2 = 9$	$3^3 = 27$
$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
$6^2 = 36$	$6^3 = 216$
$7^2 = 49$	$7^3 = 343$
$8^2 = 81$	

HW~

   WS #3

I can convert and simplify rational exponents and radicals.