Wednesday, March 30, 2016 8:30 AM

Multiplying Radical Expressions

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$

$$\sqrt{3} \cdot \sqrt{12} = \sqrt{3 \cdot 12} = \sqrt{36} = 6$$

$$\sqrt[3]{2} \cdot \sqrt[3]{-4} = \sqrt[3]{2 \cdot -4} = \sqrt[3]{-8} = -2$$

$\sqrt[5]{2} \cdot \sqrt[6]{8}$ Not possible

$$\sqrt[4]{x^2 y^8} \cdot \sqrt[4]{x^2 \cdot y^2} = \sqrt[4]{x^2 \cdot y^8 \cdot x^2 \cdot y^2} = \sqrt[4]{x^4 \cdot y^{10}} = x \cdot y^2 \sqrt[4]{y^2}$$

Dividing Radical Expressions

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$,

then $$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$$

Simplify

$$\frac{\sqrt[3]{128}}{\sqrt[3]{2}} = \sqrt[3]{\frac{128}{2}} = \sqrt[3]{64} = 4$$

$$\frac{\sqrt{32x^5}}{\sqrt{2x}} = \sqrt{\frac{32x^5}{2x}} = \sqrt{16x^4} = 4x^2$$

$$\sqrt[3]{2\cdot x\cdot y^2}\cdot\sqrt[3]{4x^2\cdot y^7} = \sqrt[3]{8\cdot x^3\cdot y^9} = 2\cdot x\cdot y^3$$

Rationalize the Denominator

$\frac{\sqrt{4}}{\sqrt{3}}$ This is a math no-no $\sqrt{\frac{12x}{5}}$

No radicals in the denominator.

No denominators inside radicals.

$$\frac{\sqrt{4}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{12}}{\sqrt{3^2}} = \frac{\sqrt{12}}{3} = \frac{2\sqrt{3}}{3}$$

$$\sqrt{\frac{12x}{5}} \cdot \frac{5}{5} = \sqrt{\frac{60x}{5^2}} = \frac{\sqrt{60x}}{\sqrt{5^2}} = \frac{\sqrt{60x}}{5}$$

$$\frac{\sqrt{4 \cdot 15x}}{5} = \frac{2\sqrt{15x}}{5}$$

To the Boards

Simplify

$$\frac{\sqrt{6x}}{\sqrt{3x}} = \sqrt{\frac{6x}{3x}} = \sqrt{2}$$

Simplify by rationalizing

$$\frac{3}{\sqrt{a}} \cdot \frac{\sqrt{a}}{\sqrt{a}} = \frac{3\sqrt{a}}{\sqrt{a^2}} = \frac{3\sqrt{a}}{a}$$

Simplify

$$\frac{\sqrt[3]{4x^2}}{\sqrt[3]{x}}$$

$$= \sqrt[3]{\frac{4x^{\cancel{2}}}{\cancel{x}}} = \sqrt[3]{4x}$$

7.3 Binomial Radical Expressions

$\boxed{\text{Like Radicals}}$

Same index, same radicand

$\sqrt[3]{4}$ $\quad\quad$ $5x\sqrt[3]{4}$

Adding and Subtracting Like Radicals

$$3\sqrt{11} + 6\sqrt{11} = 9\sqrt{11}$$

$$2x\sqrt[3]{x \cdot y} - x\sqrt[3]{x \cdot y} = (2x - x)\sqrt[3]{xy} = x \cdot \sqrt[3]{xy}$$

Multiplying Binomial Radicals

$$(3+2\sqrt{3})(2-3\sqrt{3}) = 3(2) + 3(-3)\sqrt{3} + 2(2)\sqrt{3} - 3(2)\sqrt{3}^{2}$$

$$6 - 9\sqrt{3} + 4\sqrt{3} - 6(3)$$

$$6 - 18 - 5\sqrt{3}$$

$$-12 - 5\sqrt{3}$$

Conjugtes

$$(a+\sqrt{b})(a-\sqrt{b}) = a^2 - \sqrt{b}^2 = a^2 - b$$

$$(3+\sqrt{7})(3-\sqrt{7}) = 3^2 - \sqrt{7}^2 = 9-7 = 2$$

$$(x+3\sqrt{y})(x-3\sqrt{y}) = x^2 - 9y$$

$$\frac{1}{1-\sqrt{5}}$$

Rationalizing Binomial Denominators

$$\frac{2+\sqrt{x}}{3-\sqrt{x}} \cdot \frac{3+\sqrt{x}}{3+\sqrt{x}} = \frac{6+2\sqrt{x}+3\sqrt{x}+\overset{x}{\sqrt{x}^{2}}}{9-x}$$

$$\frac{6+x+5\sqrt{x}}{9-x}$$