

April 2, 2018

Sect. 7-4a

Operations on Radical Expressions

Remember

$$\sqrt{9} = 3$$

$$\sqrt[3]{8} = 2$$

But $\sqrt{12} = ?$

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

$$\sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$$

$$\begin{aligned}\sqrt{32} &= \sqrt{4 \cdot 8} = 2\sqrt{8} = 2\sqrt{4 \cdot 2} = 4\sqrt{2} \\ &= \sqrt{16 \cdot 2} = 4\sqrt{2}\end{aligned}$$

$$\sqrt[3]{16} = \sqrt[3]{8 \cdot 2} = 2\sqrt[3]{2}$$

$$\sqrt[4]{64} = \sqrt[4]{16 \cdot 4} = 2\sqrt[4]{4}$$

$$\sqrt[2]{y^4} = |y^2| = y^2$$

$$\sqrt[2]{y^3} = \sqrt[2]{y^2 y} = |y| \sqrt[2]{y}$$

$$\begin{aligned} \sqrt[2]{a^5 b^9} &= \sqrt[2]{a^4 a b^8 b} = |a^2 b^4| \sqrt[2]{ab} \\ &= a^2 b^4 \sqrt[2]{ab} \end{aligned}$$

$$\begin{aligned}\sqrt[3]{a^7 b^{14}} &= \sqrt[3]{a^6 a^1 b^{12} b^2} \\ &= a^2 b^4 \sqrt[3]{ab^2}\end{aligned}$$

$$\begin{aligned}\sqrt[3]{x^4 y^7 z^8} &= \sqrt[3]{x^3 x^1 y^6 y^1 z^6 z^2} \\ &= x y^2 z^2 \sqrt[3]{xyz^2}\end{aligned}$$

$$\begin{aligned}\sqrt{27a^3b^7} &= \sqrt{9 \cdot 3 \cdot a^2 \cdot a \cdot b^6 \cdot b} \\ &= |3ab^3| \sqrt{3ab} \\ &= 3|ab^3| \sqrt{3ab}\end{aligned}$$

Rationalizing the Denom

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

$$\frac{5}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{\sqrt{9}} = \frac{5\sqrt{3}}{3}$$

$$\frac{6\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{6}}{\sqrt{9}} = \frac{6\sqrt{6}}{3} = 2\sqrt{6}$$

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

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

$$\begin{aligned}
 & \frac{5 \sqrt[3]{xy^2}}{\sqrt[3]{x^2y^4}} \cdot \frac{\sqrt[3]{xy^2}}{\sqrt[3]{xy^2}} = \frac{5 \sqrt[3]{x^2y^4}}{\sqrt[3]{x^3y^6}} \\
 & = \frac{5 \sqrt[3]{x^2y^3y^1}}{xy^2} = \frac{5 \cancel{y} \sqrt[3]{x^2y}}{\cancel{xy^2}} \\
 & = \frac{5 \sqrt[3]{x^2y}}{xy}
 \end{aligned}$$

