5-6 Radical Expressions Day 1

Objective: Simplify radical expressions.
Add, Subtract, multiply, and divide radical expressions.

Product Property of Radicals   n>1
1. If n is even and a and b are nonnegative, then $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

2. If n is odd, then $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

Steps to Simplifying a square root
1. Factor the radicand into as many squares as possible
2. Use the product property to isolate the perfect squares
3. Simplify each

$$\sqrt{\text{Perfect "Square" Factors}} \cdot \sqrt{\text{Other Factors}}$$

Simplify

Ex1) $\sqrt{16p^8q^7} = \sqrt{16p^8q^6}\sqrt{q} = 4p^4q^3\sqrt{q}$

Ex2) $\sqrt{25a^4b^9} = \sqrt{25a^4b^8}\sqrt{b} = 5a^2b^4\sqrt{b}$

Quotient Property

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

No Radicals Can be left in the denominator.

Simplifying Quotients

Ex3) $\sqrt{\dfrac{y^8}{x^7}} = \dfrac{\sqrt{y^8}}{\sqrt{x^7}} = \dfrac{y^4}{\sqrt{x^6}\sqrt{x}} = \dfrac{y^4}{x^3\sqrt{x}} \cdot \dfrac{\sqrt{x}}{\sqrt{x}} = \dfrac{y^4\sqrt{x}}{x^3 \cdot x^1} = \dfrac{y^4\sqrt{x}}{x^4}$

Ex4) $\sqrt[3]{\dfrac{2}{9x}} = \dfrac{\sqrt[3]{2}}{\sqrt[3]{9x}} \cdot \dfrac{\sqrt[3]{3x^2}}{\sqrt[3]{3x^2}} = \dfrac{\sqrt[3]{6x^2}}{\sqrt[3]{27x^3}} = \dfrac{\sqrt[3]{6x^2}}{3x}$

Ex5) $\sqrt[5]{\dfrac{5}{4a}} = \dfrac{\sqrt[5]{5}}{\sqrt[5]{4a}} \cdot \dfrac{\sqrt[5]{8a^4}}{\sqrt[5]{8a^4}} = \dfrac{\sqrt[5]{40a^4}}{\sqrt[5]{32a^5}} = \dfrac{\sqrt[5]{40a^4}}{2a}$

Multiplying Radicals

Ex6) $6\sqrt[3]{9n^2} \bullet 3\sqrt[3]{24n}$ $= 18\sqrt[3]{216n^3} =$

$= 18 \cdot 6 \cdot n = \boxed{108n}$

Ex7) $5\sqrt[3]{100a^2} \bullet 1\sqrt[3]{10a}$ $= 5\sqrt[3]{1000a^3}$

$= 5 \cdot 10 \cdot a = \boxed{50a}$

"Mixed" Simplifying

Ex8) $\sqrt[4]{16x^5y^4}$ $= \sqrt[4]{16x^4y^4}\sqrt[4]{x} = \boxed{2xy\sqrt[4]{x}}$

Ex9) $\sqrt{\dfrac{7}{8y}}$ $= \dfrac{\sqrt{7}}{\sqrt{8y}} \cdot \dfrac{\sqrt{2y}}{\sqrt{2y}} = \dfrac{\sqrt{14y}}{\sqrt{16y^2}} = \boxed{\dfrac{\sqrt{14y}}{4y}}$

Ex10) $-2\sqrt{15} \bullet 4\sqrt{21}$ $= -8\sqrt{315}$

$= -8\sqrt{9}\ \sqrt{35}$

$= -8 \cdot 3\sqrt{35}$

$= \boxed{-24\sqrt{35}}$