

Unit 4: Radical Expressions & Equations

4.5 Dividing & Rationalizing Radical Expressions

Dividing radicals requires the same index. Then divide/reduce the coefficients and the radicands.

In general, $\frac{m\sqrt[k]{a}}{n\sqrt[k]{b}} = \frac{m}{n} \frac{\sqrt[k]{a}}{\sqrt[k]{b}}$, where k is a natural number, and m , n , a , and b are real numbers, $n \neq 0$ and $b \neq 0$. If k is even, then $a \geq 0$ and $b \geq 0$.

ex. Simplify [always ensure that final answers are in simplest radical form]

$$a) \frac{\sqrt{80}}{\sqrt{5}} = \sqrt{\frac{80}{5}}$$

$$= \sqrt{16}$$

$$= \boxed{4}$$

$$b) \frac{-24\sqrt{40x^5}}{16\sqrt{4x^2}}$$

$$\frac{-3\sqrt{10x^3}}{2} \quad \text{or} \quad -\frac{3}{2}\sqrt{10x^3}$$

$$\boxed{\frac{-3\sqrt{10x^3}}{2} \quad \text{or} \quad -\frac{3}{2}\sqrt{10x^3}}$$

$$c) \frac{2\sqrt{105}}{5\sqrt{189}}$$

$$= \frac{2\sqrt{5}}{5\sqrt{9}}$$

$$= \boxed{\frac{2\sqrt{5}}{15}}$$

$$d) \frac{2^4\sqrt{64x}}{2^4\sqrt{2x^9}}$$

$$= \frac{\sqrt{32}}{2\sqrt{x^9}}$$

$$= \frac{2\sqrt{2}}{2x^2} = \boxed{\frac{\sqrt{2}}{x^2}}$$

Expressions are not considered to be completely simplified if they contain a radical in the denominator.

We **Rationalize The Denominator** to remove the radical from the denominator.

There are 2 cases:

Case 1: Monomial Square Root Denominator - multiply the numerator and the denominator by the radical term from the denominator.

ex. Simplify

$$a) \frac{5\sqrt{3}}{\sqrt{3} \cdot \sqrt{3}}$$

$$= \boxed{\frac{5\sqrt{3}}{3}}$$

$$b) \frac{\sqrt{3}}{\sqrt{2x}} \cdot \frac{\sqrt{2x}}{\sqrt{2x}}$$

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

$$c) \frac{4+\sqrt{5}}{\sqrt{40}}$$

$$= \frac{(4+\sqrt{5}) \cdot \sqrt{10}}{2\sqrt{10} \cdot \sqrt{10}}$$

$$= \frac{4\sqrt{10} + \sqrt{50}}{20}$$

$$= \boxed{\frac{4\sqrt{10} + 5\sqrt{2}}{20}}$$

$$d) \frac{2\sqrt{5}}{3\sqrt{125}}$$

$$= \frac{2}{3\sqrt{25}}$$

$$= \boxed{\frac{2}{15}}$$

How can we extend this idea to higher index radicals?

ex. Simplify

$$a) \frac{9}{2^3\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{9\sqrt{9}}{6}$$

$$= \boxed{\frac{3\sqrt{9}}{2}}$$

$$b) \frac{(3-5^4\sqrt{2})}{\sqrt[4]{2}} \cdot \frac{\sqrt[4]{8}}{\sqrt[4]{8}}$$

$$= \frac{3\sqrt[4]{8} - 5\sqrt[4]{16}(2)}{2}$$

$$= \boxed{\frac{3\sqrt[4]{8} - 10}{2}}$$

& Worksheet(211) – on sheet or seperate