

11-1b Multiplying and Dividing Radicals

When performing operations on radicals, we can follow some of the same guidelines as when we perform operations on like and unlike terms. As you know, we are able to multiply and divide unlike terms. Consider the unlike terms $8x^6$ and $2x^2$.

$$(8x^6)(2x^2) = 16x^8$$

$$\frac{8x^6}{2x^2} = 4x^4$$

Just like with multiplying and dividing unlike terms, we **multiply/divide the coefficients and then multiply/divide the radicals**. Then SIMPLIFY!!!

1. $\sqrt{8} \cdot \sqrt{12}$

$$\begin{array}{c} \sqrt{96} \\ / \quad \backslash \\ \sqrt{16} \quad \sqrt{6} \\ \hline 4\sqrt{6} \end{array}$$

2. $\sqrt{13} \cdot \sqrt{52}$

$$\begin{array}{c} \sqrt{676} \\ \hline 26 \end{array}$$

3. $5\sqrt{3c} \cdot \sqrt{6c}$

$$5\sqrt{18c^2}$$

$$\begin{array}{c} 5 \\ \hline \sqrt{18} \quad \sqrt{c^2} \\ \sqrt{9} \sqrt{2} \quad \underline{c} \\ \underline{3} \sqrt{2} \\ \hline 15c\sqrt{2} \end{array}$$

4. $2\sqrt{5a^2} \cdot 6\sqrt{10a^3}$

$$12\sqrt{50a^5}$$

$$\begin{array}{c} 12 \\ \hline \sqrt{50} \quad \sqrt{a^5} \\ \sqrt{25} \sqrt{2} \quad a^{2.5} \\ \underline{5} \sqrt{2} \quad a^2 \sqrt{a} \\ \hline * 60a^2 \sqrt{2a} * \end{array}$$

The Division Property of Square Roots can also be used to simplify expressions.

Division Property of Square Roots

For every number, $a \geq 0$, and $b > 0$,

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

1. $\sqrt{\frac{144}{9}} = \sqrt{16}$
 $= 4$

2. $\frac{\sqrt{100}}{5} = \frac{10}{5}$
 $= 2$

3. $\frac{\sqrt{384}}{\sqrt{8}}$

$\sqrt{48}$

$\sqrt{16} \sqrt{3}$

$4\sqrt{3}$

4. $\frac{-28\sqrt{180}}{4\sqrt{5}}$

$-7\sqrt{36}$

-42

Challenge

5. $\frac{15\sqrt{12x^{12}}}{-5\sqrt{3x^6}}$

$= -3\sqrt{4x^6}$

$= -3 \cdot 2 \cdot x^3$

$= -6x^3$

1. Expressed in simplest radical form, the product of $\sqrt{6}$ and $\sqrt{15}$?

(1) $\sqrt{90}$

(2) $3\sqrt{10}$

(3) $9\sqrt{10}$

(4) $3\sqrt{15}$

Simplify the following Expression.

2. $-5\sqrt{3} \cdot 2\sqrt{24}$

3. $\sqrt{\frac{60}{5}}$

4. $\frac{6\sqrt{20}}{3\sqrt{5}}$

5. $\frac{-26\sqrt{144}}{2\sqrt{3}}$

6. $4\sqrt{3}(5\sqrt{3} - \sqrt{12})$