U7L4: Simplifying Radicals

Students can multiply and divide radicals.
Students can simplify radicals and write exact answers.

Multiplication Property of Square Roots

For any numbers $a \geq 0$ and $b \geq 0$,

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

Example 1: Simplify

a. $\sqrt{192}$

$\sqrt{64 \cdot 3}$
$\sqrt{64} \cdot \sqrt{3}$
$8\sqrt{3}$

b. $\sqrt{16a^3}$

$\sqrt{16 \cdot a^2 \cdot a}$
$\sqrt{16} \cdot \sqrt{a^2} \cdot \sqrt{a}$
$4a\sqrt{a}$

Example 2: Simplify

a. $5\sqrt{300}$

$5 \cdot \sqrt{100} \cdot \sqrt{3}$
$5(10)\sqrt{3}$
$50\sqrt{3}$

b. $\sqrt{6} \bullet \sqrt{15}$

$\sqrt{90}$
$\sqrt{9} \cdot \sqrt{10} = 3\sqrt{10}$

c. $\sqrt{x^2y^5}$

$\sqrt{x^2} \cdot \sqrt{y^4} \cdot \sqrt{y}$
$xy^2\sqrt{y}$

d. $(3\sqrt{5})^2$

$(3)^2(\sqrt{5})^2$
$9(5)$
45

$15 \cdot 15$
225
5

Division Property of Square Roots

For any numbers $a \geq 0$ and $b > 0$,

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

Example 3: Simplify

a. $\sqrt{\frac{11}{49}} = \frac{\sqrt{11}}{\sqrt{49}} = \frac{\sqrt{11}}{7}$

b. $\sqrt{\frac{25}{b^4}} = \frac{\sqrt{25}}{\sqrt{b^4}} = \frac{5}{b^2}$

Example 4: Simplify

a. $\frac{\sqrt{96}}{\sqrt{12}} = \sqrt{\frac{96}{12}}$
$= \sqrt{8}$
$= \sqrt{4} \cdot \sqrt{2}$
$= 2\sqrt{2}$

b. $\sqrt{\frac{25c^3}{b^2}} = \frac{\sqrt{25c^3}}{\sqrt{b^2}}$
$= \frac{\sqrt{25} \cdot \sqrt{c^2} \cdot \sqrt{c}}{\sqrt{b^2}}$
$= \frac{5c\sqrt{c}}{b}$

Example 5: Simplify

a. $\frac{2}{\sqrt{5}} \bullet \frac{\sqrt{5}}{\sqrt{5}}$
$\frac{2\sqrt{5}}{5}$

rationalize → make den. rational

c. $\frac{14}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$
$\frac{14\sqrt{7}}{7}$
$2\sqrt{7}$