

Algebra 1

Lesson 11.2B

Simplify Radical Expressions

Warm-Up
Simplify.

(a) $\sqrt{45}$

$$\begin{aligned} &\sqrt{9 \cdot 5} \\ &\sqrt{9} \cdot \sqrt{5} \\ &3\sqrt{5} \end{aligned}$$

(b) $\sqrt{56a^2}$

$$\begin{aligned} &\sqrt{14 \cdot 4 \cdot a^2} \\ &2a\sqrt{14} \end{aligned}$$

(c) $\sqrt{2} \cdot \sqrt{14}$

$$\begin{aligned} &\sqrt{28} \\ &\sqrt{4 \cdot 7} \\ &2\sqrt{7} \end{aligned}$$

(d) $2\sqrt{3} \cdot \sqrt{6}$

$$\begin{aligned} &2\sqrt{18} \\ &2\sqrt{9 \cdot 2} \\ &6\sqrt{2} \end{aligned}$$

Example 1. Rationalizing the Denominator

Simplify.

(a) $\frac{7}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{7\sqrt{6}}{6}$

(b) $\sqrt{\frac{1}{2}} = \frac{\sqrt{1}}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$$\frac{\sqrt{3}}{\sqrt{5a}} \cdot \frac{\sqrt{5a}}{\sqrt{5a}} = \frac{\sqrt{15a}}{5a}$$

(d) $\frac{3}{\sqrt{2x}} \cdot \frac{\sqrt{2x}}{\sqrt{2x}} = \frac{3\sqrt{2x}}{2x}$

Example 2. Adding and Subtracting Radicals

Simplify.

(a) $2\sqrt{2} + 4\sqrt{2}$

$$6\sqrt{2}$$

(b) $5\sqrt{3} - 3\sqrt{3} + 3\sqrt{5}$

$$2\sqrt{3} + 3\sqrt{5}$$

(c) $2\sqrt{7} + \sqrt{28}$

$$\begin{aligned} &2\sqrt{7} + \sqrt{4 \cdot 7} \\ &2\sqrt{7} + 2\sqrt{7} \\ &4\sqrt{7} \end{aligned}$$

Try It!
Simplify.

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

$\frac{3\sqrt{3}}{3}$
 $\sqrt{3}$

(b) $4\sqrt{10} + \sqrt{13} - 9\sqrt{10}$
 $-5\sqrt{10} + \sqrt{13}$

(c) $\frac{\sqrt{2}}{\sqrt{5}}$
 $\frac{\sqrt{2}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$
 $\frac{\sqrt{10}}{5}$

(d) $3\sqrt{5} - \sqrt{20}$
 $3\sqrt{5} - \sqrt{4 \cdot 5}$
 $3\sqrt{5} - 2\sqrt{5}$
 $\sqrt{5}$

Example 3. Multiply Radical Expressions
Simplify.

(a) $\sqrt{3}(2 + \sqrt{12})$

$2\sqrt{3} + \sqrt{36}$
 $2\sqrt{3} + 6$
or
 $6 + 2\sqrt{3}$

(b) $\sqrt{2}(\sqrt{3} - \sqrt{8})$

$\sqrt{6} - \sqrt{16}$
 $\sqrt{6} - 4$
or
 $-4 + \sqrt{6}$

(c) $(\sqrt{2} + \sqrt{5})(\sqrt{2} - 3\sqrt{5})$

$2 - 3\sqrt{10} + \sqrt{10} - 3\sqrt{25}$
 $2 - 2\sqrt{10} - 15$
 $-2\sqrt{10} - 13$
or
 $-13 - 2\sqrt{10}$

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

$5 + 4\sqrt{15} + 12$
 $17 + 4\sqrt{15}$
or
 $4\sqrt{15} + 17$

Try It!
Simplify.

(a) $\sqrt{5}(2\sqrt{3} + \sqrt{8})$

$2\sqrt{15} + \sqrt{40}$
 $2\sqrt{15} + \sqrt{4 \cdot 10}$
 $2\sqrt{15} + 2\sqrt{10}$

(b) $\sqrt{6}(3\sqrt{2} - 4\sqrt{3})$

$3\sqrt{12} - 4\sqrt{18}$
 $3\sqrt{4 \cdot 3} - 4\sqrt{9 \cdot 2}$
 $6\sqrt{3} - 12\sqrt{2}$

(c) $(2 + \sqrt{7})(3 - \sqrt{5})$

$6 - 2\sqrt{5} + 3\sqrt{7} - \sqrt{35}$

(d) $(\sqrt{7} - \sqrt{2})^2$

$7 - 2\sqrt{14} + 2$
 $9 - 2\sqrt{14}$

Homework:

New: Pg. 723 #26-45

Review:
Simplify

1. $\sqrt{98}$

2. $\sqrt{121x^3}$

3. $\frac{\sqrt{25}}{\sqrt{16}}$

4. $\frac{\sqrt{5}}{\sqrt{x^2}}$