OBJECTIVE 1

1 EXAMPLE Simplify $\sqrt{243}$.

$\sqrt{243} = \sqrt{81 \cdot 3}$ 81 is a perfect square and a factor of 243.

$= \sqrt{81} \cdot \sqrt{3}$ Use the Multiplication Property of Square Roots.

$= 9\sqrt{3}$ Simplify $\sqrt{81}$.

OBJECTIVE 1

2 EXAMPLE Simplify $\sqrt{28x^7}$.

$\sqrt{28x^7} = \sqrt{4x^6 \cdot 7x}$ $4x^6$ is a perfect square and a factor of $28x^7$.

$= \sqrt{4x^6} \cdot \sqrt{7x}$ Use the Multiplication Property of Square Roots.

$= 2x^3\sqrt{7x}$ Simplify $\sqrt{4x^6}$.

OBJECTIVE 1

3 EXAMPLE Simplify each radical expression.

a. $\sqrt{12} \cdot \sqrt{32}$

$\sqrt{12} \cdot \sqrt{32} = \sqrt{12 \cdot 32}$ Use the Multiplication Property of Square Roots.

$= \sqrt{384}$ Simplify under the radical.

$= \sqrt{64 \cdot 6}$ 64 is a perfect square and a factor of 384.

$= \sqrt{64} \cdot \sqrt{6}$ Use the Multiplication Property of Square Roots.

$= 8\sqrt{6}$ Simplify $\sqrt{64}$.

OBJECTIVE 1

3 EXAMPLE (continued)

b. $7\sqrt{5x} \cdot 3\sqrt{8x}$

$7\sqrt{5x} \cdot 3\sqrt{8x} = 21\sqrt{40x^2}$ Multiply the whole numbers and use the Multiplication Property of Square Roots.

$= 21\sqrt{4x^2 \cdot 10}$ $4x^2$ is a perfect square and a factor of $40x^2$.

$= 21\sqrt{4x^2} \cdot \sqrt{10}$ Use the Multiplication Property of Square Roots.

$= 21 \cdot 2x\sqrt{10}$ Simplify $\sqrt{4x^2}$.

$= 42x\sqrt{10}$ Simplify.

OBJECTIVE 1

4 EXAMPLE Suppose you are looking out a fourth floor window 52 ft above the ground. Use the formula $d = \sqrt{1.5h}$ to estimate the distance you can see to the horizon. Round your answer to the nearest mile.

$d = \sqrt{1.5h}$

$= \sqrt{1.5 \cdot 52}$ Substitute 52 for h.

$= \sqrt{78}$ Multiply.

≈ 8.83176 Use a calculator.

To the nearest mile, the distance you can see is 9 miles.

OBJECTIVE 2

5 EXAMPLE Simplify each radical expression.

a. $\sqrt{\frac{13}{64}}$

$\sqrt{\frac{13}{64}} = \frac{\sqrt{13}}{\sqrt{64}}$ Use the Division Property of Square Roots.

$= \frac{\sqrt{13}}{8}$ Simplify $\sqrt{64}$.

b. $\sqrt{\frac{49}{x^4}}$

$\sqrt{\frac{49}{x^4}} = \frac{\sqrt{49}}{\sqrt{x^4}}$ Use the Division Property of Square Roots.

$= \frac{7}{x^2}$ Simplify $\sqrt{49}$ and $\sqrt{x^4}$.

OBJECTIVE 2

6 EXAMPLE Simplify each radical expression.

a. $\sqrt{\frac{120}{10}}$

$\sqrt{\frac{120}{10}} = \sqrt{12}$ Divide.

$= \sqrt{4 \cdot 3}$ 4 is a perfect square and a factor of 12.

$= \sqrt{4} \cdot \sqrt{3}$ Use the Multiplication Property of Square Roots.

$= 2\sqrt{3}$ Simplify $\sqrt{4}$.

OBJECTIVE 2

6 EXAMPLE (continued)

b. $\sqrt{\frac{75x^5}{48x}}$

$$\sqrt{\frac{75x^5}{48x}} = \sqrt{\frac{25x^4}{16}}$$

Divide the numerator and denominator by $3x$.

$$= \frac{\sqrt{25x^4}}{\sqrt{16}}$$

Use the Division Property of Square Roots.

$$= \frac{\sqrt{25} \cdot \sqrt{x^4}}{\sqrt{16}}$$

Use the Multiplication Property of Square Roots.

$$= \frac{5x^2}{4}$$

Simplify $\sqrt{25}$, $\sqrt{x^4}$, and $\sqrt{16}$.

OBJECTIVE 2

7 EXAMPLE Simplify the radical expression.

a. $\frac{3}{\sqrt{7}}$

$$\frac{3}{\sqrt{7}} = \frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$$

Multiply by $\frac{\sqrt{7}}{\sqrt{7}}$ to make the denominator a perfect square.

$$= \frac{3\sqrt{7}}{\sqrt{49}}$$

Use the Multiplication Property of Square Roots.

$$= \frac{3\sqrt{7}}{7}$$

Simplify $\sqrt{49}$.

OBJECTIVE 2

7 EXAMPLE **(continued)**

Simplify the radical expression.

b. $\dfrac{\sqrt{11}}{\sqrt{12x^3}}$

$$\frac{\sqrt{11}}{\sqrt{12x^3}} = \frac{\sqrt{11}}{\sqrt{12x^3}} \cdot \frac{\sqrt{3x}}{\sqrt{3x}}$$

Multiply by $\dfrac{\sqrt{3x}}{\sqrt{3x}}$ to make the denominator a perfect square.

$$= \frac{\sqrt{33x}}{\sqrt{36x^4}}$$

Use the Multiplication Property of Square Roots.

$$= \frac{\sqrt{33x}}{6x^2}$$

Simplify $\sqrt{36x^4}$.