

11-1

Simplifying Radicals

Check Skills You'll Need TX+bK p.616

Complete each equation.

1. $a^3 = a^2 \cdot a^1$ 2. $b^7 = b^6 \cdot b^1$

3. $c^6 = c^3 \cdot c^3$ 4. $d^8 = d^4 \cdot d^4$

Find the value of each expression.

5. $\sqrt{4} = 2$ 6. $\sqrt{169} = 13$

7. $\sqrt{25} = 5$ 8. $\sqrt{49} = 7$ ✓

Perfect Square #'s
1, 4, 9, 16, 25, 36, 49, 64,
81, 100, 121, 144, 169, 196,
225

Key Concepts

Day 83

Multiplication Property of Square Roots

For every number $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.

Example $\sqrt{54} = \sqrt{9} \cdot \sqrt{6} = 3 \cdot \sqrt{6} = 3\sqrt{6}$

Division Property of Square Roots

For every number $a \geq 0$ and $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.

Example $\sqrt{\frac{16}{25}} = \frac{\sqrt{16}}{\sqrt{25}} = \frac{4}{5}$

Simplest Radical Form

A radical expression is in simplest radical form when all three statements are true.

• The radicand has no perfect square factors other than 1. $\sqrt{2 \cdot 4} = 2\sqrt{2}$

• The radicand has no fractions $\sqrt{\frac{3}{4}}$

• The denominator has no radical. $\frac{\sqrt{2}}{\sqrt{3}}$

$\sqrt{\text{radicand}}$ $\frac{\sqrt{3}}{2} \checkmark$

$2\sqrt{3}, \sqrt{7}$ an expression that has a coefficient & a radicand

Rationalize means get rid of radicals in the denominator of the fraction

Simplify the radical expression.

$$\sqrt{147} = \sqrt{49 \cdot 3} = 7\sqrt{3}$$

$$\sqrt{27} = \sqrt{9 \cdot 3} = 3\sqrt{3}$$

$$\sqrt{200} = \sqrt{100 \cdot 2} = 10\sqrt{2}$$

$$\sqrt{12x^4}$$

Examples

1 Removing Variable Factors Simplify $\sqrt{28x^7}$.

$$\sqrt{28} = \sqrt{4 \cdot 7}$$

$$\sqrt{\cancel{x} \cancel{x} \cancel{x} \cancel{x} x^3 \sqrt{7x}} = 2x^3 \sqrt{7x}$$

Quick Check

Simplify each radical expression.

1. $-\sqrt{60a^8}$

$$-\sqrt{4 \cdot 15 \cdot a^4 \cdot a^4} = -2a^4 \sqrt{15} = -2a^5 \sqrt{15}$$

2. Multiplying Two Radicals Simplify each radical expression.

a. $\sqrt{12} \cdot \sqrt{32} = \sqrt{384} = \sqrt{64 \cdot 6} = 8\sqrt{6}$

b. $7\sqrt{5x} \cdot 3\sqrt{8x} = 21\sqrt{40x^2}$

$$21 \cdot 2x \sqrt{10} = 42x\sqrt{10}$$

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2. a. $\sqrt{13} \cdot \sqrt{52} = \sqrt{676} = \sqrt{4 \cdot 169} = 2 \cdot 13 = 26$

b. $5\sqrt{3c} \cdot \sqrt{6c} = 5\sqrt{18c^2} = 5 \cdot 3c \cdot \sqrt{2} = 15c\sqrt{2}$

ex $\sqrt{3n} \cdot \sqrt{24n^2} = \sqrt{72n^3} = \sqrt{36 \cdot 2 \cdot n \cdot n \cdot n} = 6n\sqrt{2n}$

$(10\sqrt{3})^2$ $(10\sqrt{3})^2$ calculator
 $(10\sqrt{3})(10\sqrt{3}) = 100\sqrt{9}$
 $100 \cdot 3$
 300

$(3\sqrt{2})^3$
 $(3\sqrt{2})(3\sqrt{2})(3\sqrt{2})$
 $27\sqrt{8}$
 $\sqrt{4} \cdot \sqrt{2}$
 $27 \cdot 2\sqrt{2}$
 $54\sqrt{2}$

3 Simplifying Radicals by Dividing Simplify $\sqrt{\frac{75x^3}{48x^4}}$.
 1st: simplify or reduce fraction 1st

$\sqrt{\frac{25 \cancel{x} \cancel{x} \cancel{x}}{16 \cancel{x}}} = \sqrt{\frac{25x^3}{16}}$

Quick Check p.197
 3. $\sqrt{\frac{27x^3}{3x^4}} = \sqrt{9x^2} = 3x$

4 Rationalizing a Denominator Simplify by rationalizing the denominator.

a. $\frac{3}{\sqrt{7}}$ Multiply by $\frac{\sqrt{7}}{\sqrt{7}}$ to make the denominator a perfect square
 $= \frac{3\sqrt{7}}{\sqrt{49}}$
 $= \frac{3\sqrt{7}}{7}$
 Use the Multiplication Property of Square Roots.
 Simplify: $\frac{\sqrt{3} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$

b. $\frac{\sqrt{11}}{\sqrt{12x^3}}$ = $\frac{\sqrt{11}}{2x\sqrt{3x}}$
 $\frac{\sqrt{11}}{2x\sqrt{3x}} \cdot \frac{\sqrt{3x}}{\sqrt{3x}} = \frac{\sqrt{11} \cdot \sqrt{3x}}{2x \cdot \sqrt{9x^2}} = \frac{\sqrt{33x}}{2x \cdot 3x} = \frac{\sqrt{33x}}{6x^2}$

4. a. $\frac{3}{\sqrt{3}}$ b. $\frac{\sqrt{5}}{\sqrt{18t}}$

$$\sqrt{\frac{17}{144}}$$

$$\frac{\sqrt{65}}{\sqrt{13}}$$

$$\sqrt{\frac{12}{225}}$$

$$\sqrt{\frac{27x^2}{256}}$$

HW: Wkbk p.461 (1st 2 columns)
