

10-2 Reteaching

Simplifying Radicals

You can remove perfect-square factors from a radicand.

Problem

What is the simplified form of $\sqrt{80n^5}$?

In the radicand, factor the coefficient and the variable separately into perfect square factors, and then simplify. Factor 80 and n^5 completely and then find paired factors.

Solve

$$80 = 8 \cdot 10 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$$

$$= (2 \cdot 2)(2 \cdot 2) \cdot 5 = (2 \cdot 2)^2 \cdot 5$$

$$\sqrt{80} = \sqrt{4^2 \cdot 5} = \sqrt{4^2} \cdot \sqrt{5}$$

$$= 4 \cdot \sqrt{5} = 4\sqrt{5}$$

$$n^5 = n \cdot n \cdot n \cdot n \cdot n$$

$$= (n \cdot n) \cdot (n \cdot n) \cdot n = (n \cdot n)^2 \cdot n$$

$$\sqrt{n^5} = \sqrt{(n \cdot n)^2} \cdot \sqrt{n}$$

$$= n^2 \cdot \sqrt{n} = n^2\sqrt{n}$$

$$\sqrt{80n^5} = 4 \cdot n^2\sqrt{5 \cdot n} = 4n^2\sqrt{5n}$$

Check

$$\sqrt{80n^5} \stackrel{?}{=} 4n^2\sqrt{5n}$$

$$\frac{\sqrt{80n^5}}{\sqrt{5n}} \stackrel{?}{=} \frac{4n^2\sqrt{5n}}{\sqrt{5n}}$$

$$\sqrt{16n^4} \stackrel{?}{=} 4n^2$$

$$4n^2 = 4n^2 \checkmark$$

Factor 80 completely.

Find pairs of factors.

Use the rule $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.

The square root of a number squared is the number: $\sqrt{a^2} = a$.

Factor n^5 completely.

Find pairs of factors.

Separate the factors.

Remove the perfect square.

Combine your answers.

Check your solution.

Divide both sides by $\sqrt{5n}$.

Simplify.

Solution: The simplified form of $\sqrt{80n^5}$ is $4n^2\sqrt{5n}$.

Exercises

Simplify each radical expression.

1. $\sqrt{100n^3}$ $10n\sqrt{n}$

2. $\sqrt{120b^4}$ $2b^2\sqrt{30}$

3. $\sqrt{66t^5}$ $t^2\sqrt{66t}$

4. $\sqrt{32x}$ $4\sqrt{2x}$

5. $\sqrt{525c^7}$ $5c^3\sqrt{21c}$

6. $\sqrt{86t^2}$ $t\sqrt{86}$

7. $\sqrt{50g^3}$ $5g\sqrt{2g}$

8. $\sqrt{54h^6}$ $3h^3\sqrt{6}$

9. $\sqrt{35y}$ $\sqrt{35y}$

10-2 Reteaching (continued)

Simplifying Radicals

Problem

What is the simplified form of $\sqrt{\frac{27t^3}{48t^2}}$?

Begin by cancelling the common factors in the numerator and denominator. Simplify the numerator and denominator separately when the denominator is a perfect square. Remember that the radical is not simplified if there is a radical in the denominator. Multiply to remove the radical from the denominator.

Solve	$\sqrt{\frac{27t^3}{48t^2}} = \sqrt{\frac{3 \cdot 3 \cdot 3 \cdot t \cdot t \cdot t}{3 \cdot 4 \cdot 4 \cdot t \cdot t \cdot t}}$ $= \sqrt{\frac{\cancel{3} \cdot 3 \cdot 3 \cdot \cancel{t} \cdot \cancel{t} \cdot \cancel{t}}{\cancel{3} \cdot 4 \cdot 4 \cdot \cancel{t} \cdot \cancel{t} \cdot \cancel{t}}}$ $= \frac{\sqrt{3 \cdot 3}}{\sqrt{4 \cdot 4}t} = \frac{\sqrt{3^2}}{\sqrt{4^2}t}$ $= \frac{3}{4\sqrt{t}}$ $= \frac{3}{4\sqrt{t}} \cdot \frac{(\sqrt{t})}{(\sqrt{t})}$ $= \frac{3\sqrt{t}}{4\sqrt{t} \cdot t} = \frac{3\sqrt{t}}{4\sqrt{t^2}} = \frac{3\sqrt{t}}{4t}$	<p>Factor the numerator and denominator completely.</p> <p>Cancel the common factors.</p> <p>Find pairs of factors. These are the perfect-square factors.</p> <p>Simplify the numerator and denominator separately to remove the perfect-square factors. $\sqrt{3^2} = 3$ and $\sqrt{4^2}t = 4\sqrt{t}$</p> <p>Multiply the numerator and denominator by \sqrt{t} to remove \sqrt{t} from the denominator.</p> <p>Remove the perfect-square factor from the denominator.</p>
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Solution: The simplified form of $\sqrt{\frac{27t^3}{48t^2}}$ is $\frac{3\sqrt{t}}{4t}$.

Exercises

Simplify each radical expression.

10. $\sqrt{\frac{49}{81}} \cdot \frac{7}{9}$

11. $\sqrt{\frac{18x^4}{200}} \cdot \frac{3x^2}{10}$

12. $\sqrt{\frac{28s}{s^3}} \cdot \frac{2\sqrt{7}}{s}$

13. $\sqrt{\frac{25a^5}{9a^7}} \cdot \frac{5}{3a}$

14. $\sqrt{\frac{40b^4}{12b^3}} \cdot \frac{\sqrt{30b}}{3}$

15. $\sqrt{\frac{48}{6t^6}} \cdot \frac{2\sqrt{2}}{t^3}$

16. $\sqrt{\frac{50z^3}{4x^2}} \cdot \frac{5z\sqrt{2z}}{2x}$

17. $\sqrt{\frac{t^5}{64}} \cdot \frac{t^2\sqrt{t}}{8}$

18. $\sqrt{\frac{32t}{t}} \cdot 4\sqrt{2}$