Algebra 2 6.5 $\sqrt{\ }$ = pairs

Simplify radical expressions

Add subtract multiply & divide radical expressions

index

like terms $\sqrt[3]{\ }$ = triplets

radical expression

denominators $\sqrt[4]{\ }$ quad.

rationalizing the denominator

conjugate (4.4)

EWE

whiteboards

KeyConcept Product Property of Radicals

Words For any real numbers a and b and any integer $n > 1$, $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$, if n is even and a and b are both nonnegative or if n is odd.

Examples $\sqrt{2} \cdot \sqrt{8} = \sqrt{16}$ or 4 and $\sqrt[3]{3} \cdot \sqrt[3]{9} = \sqrt[3]{27}$ or 3

$\sqrt{2 \cdot 8}$ $\qquad$ $\sqrt[3]{3 \cdot 9}$

$\sqrt{16} = 4$ $\qquad$ $\sqrt[3]{27} = 3$

Must have same index
Take out groups of .....
What to do if some are left over?

index...
Simplify is not asking for a decimal answer...take out pairs, or triplets, etc.

Example 1 Simplify Expressions with the Product Property

Simplify.

a. $\sqrt[4]{32x^8} = 4x^4\sqrt{2}$

32
16 ^ 2
4 ^ 4

$x^4 4\sqrt{2}$

b. $\sqrt[4]{16a^{26}b^{13}}$

$\frac{13}{4}$

$2a^6b^3\sqrt[4]{b}$

$4\sqrt{}$

1A. $\sqrt{12c^6d^3}$

$3 \wedge 4$

$2 \wedge 2$

$2c^3d\sqrt{3d}$

1B. $\sqrt[3]{27y^{12}z^7}$

You can join or separate if same index

KeyConcept Quotient Property of Radicals

Words For any real numbers a and $b \neq 0$ and any integer $n > 1$,

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}, \text{ if all roots are defined.}$$

Examples $\frac{\sqrt{27}}{\sqrt{3}} = \sqrt{9}$ or 3 $\sqrt[3]{\frac{x^6}{8}} = \frac{\sqrt[3]{x^6}}{\sqrt[3]{8}} = \frac{x^2}{2}$ or $\frac{1}{2}x^2$

$\sqrt{\frac{27}{3}} = 3$ $\frac{\sqrt[3]{x^6}}{\sqrt[3]{8}} = \frac{x^2}{2}$

Example 2 Simplify Expressions with the Quotient Property

Simplify.

a. $\sqrt{\frac{x^6}{y^7}}$

b. $\sqrt[4]{\frac{6}{5x}}$

$$\frac{\sqrt{x^6}}{\sqrt{y^7}} = \frac{x^3}{y^3\sqrt{y}} \cdot \left(\frac{\sqrt{y}}{\sqrt{y}}\right) = \frac{x^3\sqrt{y}}{y^4}$$

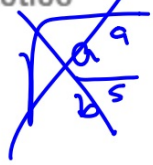
$\sqrt{y^2}$

$$\frac{\sqrt[4]{6^{2\cdot 3}}}{\sqrt[4]{5x}} \left(\frac{\sqrt[4]{555xxx}}{\sqrt[4]{555xxx}}\right)$$

$$\frac{\sqrt[4]{750x^3}}{5x}$$

GuidedPractice

2A. $\dfrac{\sqrt{a^9}}{\sqrt{b^5}}$



$\dfrac{a^4\sqrt{a}}{b^2\sqrt{b}} \cdot \dfrac{\sqrt{b}}{\sqrt{b}} = \dfrac{a^4\sqrt{ab}}{b^3}$

$\dfrac{\sqrt[5]{3}}{\sqrt[5]{4y}} \cdot \dfrac{\sqrt[5]{4\cdot4\cdot4\cdot y\,y\,y\,y}}{\sqrt[5]{4\cdot4\cdot4\cdot y\,y\,y\,y}}$

$\dfrac{\sqrt[5]{768y^4}}{4y}$

168

$16 \quad 4\ 8$

$4\ 4 \quad 6\ 8$

$2\ 2 \quad 2\ 2 \quad 2\ 2 \quad 4\ 2$

$2\ 2$

$2\ 2\ 2\ 2\ 2\ 2\ 2\ 3$

2B. $\sqrt[5]{\dfrac{3}{4y}}$

$\dfrac{\sqrt[5]{3}}{\sqrt[5]{2\cdot2y}} \cdot \dfrac{\sqrt[5]{2\cdot2\cdot2yyyy}}{\sqrt[5]{2\cdot2\cdot2\cdot yyyy}}$

$\dfrac{2\sqrt[5]{24y^4}}{4y} \rightarrow \dfrac{\sqrt[5]{24y^4}}{2y}$

p 417

ConceptSummary Simplifying Radical Expressions

A radical expression is in simplified form when the following conditions are met.

- The index n is as small as possible. talk later...
- The radicand contains no factors (other than 1) that are nth powers of an integer or polynomial. take out pairs, etc. ...
- The radicand contains no fractions.
- No radicals appear in a denominator.

Must be same index to multiply
(are they?)
Multiply
Simplify your answer

Example 3 Multiply Radicals

Simplify $5\sqrt[3]{-12ab^4} \cdot 3\sqrt[3]{18a^2b^2}$.

$15\sqrt[3]{-12abbbb18aabb}$

$15\sqrt[3]{-216}$

$15ab^2 \cdot -6$

$-90ab^2$

GuidedPractice

Simplify.

3A. $6\sqrt{8c^3d^5} \cdot 4\sqrt{2cd^3}$

3B. $2\sqrt[4]{8x^3y^2} \cdot 3\sqrt[4]{2x^5y^2}$

$24\sqrt{16c^4d^8}$

$96c^2d^4$

$6\sqrt[4]{16x^8y^4}$

$12x^2y$

Like: $\sqrt{3b}$ and $4\sqrt{3b}$

Unlike: $\sqrt{3b}$ and $\sqrt[3]{3b}$

Unlike: $\sqrt{2b}$ and $\sqrt{3b}$

$\sqrt{x} + \sqrt{x}$

$2\sqrt{x}$

$\sqrt[3]{2y} + \sqrt[3]{2y}$

$2\sqrt[3]{2y}$

Like: Same index & same radicand

~~$2a$~~

$a + a$

$2a$

Simplify first...they might be like terms...

Are they like terms????

Example 4 Add and Subtract Radicals

Simplify $\sqrt{98} - 2\sqrt{32}$.

$49 \cdot 2$ $\quad$ $16 \cdot 2$

$7 \cdot 7$ $\quad$ $4 \cdot 4$

$7\sqrt{2} - 2 \cdot 4\sqrt{2}$

$7\sqrt{2} - 8\sqrt{2}$

$-\sqrt{2}$

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4A. $4\sqrt{8} + 3\sqrt{50}$

$4 \cdot 2\sqrt{2} + 3 \cdot 5\sqrt{2}$

$8\sqrt{2} + 15\sqrt{2}$

$23\sqrt{2}$

4B. $5\sqrt{12} + 2\sqrt{27} - \sqrt{128}$

$5 \cdot 2\sqrt{3} + 2 \cdot 3\sqrt{3} - 8\sqrt{2}$

$10\sqrt{3} + 6\sqrt{3} - 8\sqrt{2}$

$16\sqrt{3} - 8\sqrt{2}$

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Example 5 Multiply Radicals

Simplify $(4\sqrt{3} + 5\sqrt{2})(3\sqrt{2} - 6)$.

$4\sqrt{3} + 5\sqrt{2}$

$3\sqrt{2} - 6$

$-24\sqrt{3} \quad -30\sqrt{2}$

$12\sqrt{6} + 15\sqrt{4}$

$30 + 12\sqrt{6} - 24\sqrt{3} - 30\sqrt{2}$

GuidedPractice

Simplify.

5A. $(6\sqrt{3} - 5)(2\sqrt{5} + 4\sqrt{2})$

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

$$\frac{2\sqrt{3}+5}{4\sqrt{2}-3} \cdot \frac{4\sqrt{2}+3}{4\sqrt{2}+3} = \frac{15+6\sqrt{3}+8\sqrt{6}+20\sqrt{2}}{23}$$

$$\begin{array}{r} 2\sqrt{3}+5 \\ 4\sqrt{2}+3 \\ \hline 6\sqrt{3}+15 \\ 8\sqrt{6}+20\sqrt{2} \end{array}$$

$$\begin{array}{r} 4\sqrt{2}-3 \\ 4\sqrt{2}+3 \\ \hline 12\sqrt{2} \\ +12\sqrt{2} \\ \hline 16\sqrt{4} \end{array} \quad \begin{array}{l} -9 \\ \\ \\ 32-9 \end{array}$$