

Day 2 - 3.1 - Roots & Radical Expressions

Dividing Radicals



Property Combining Radical Expressions: Quotients

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$.

If the index are the same then you may rewrite.

What is the simplest form of the quotient?

Ex. 1 $\frac{\sqrt{18x^5}}{\sqrt{2x^3}} \rightarrow \frac{\sqrt{9x^2}}{\sqrt{1}} = \frac{3x}{1} = \textcircled{3x}$

What is the simplest form of the quotient?

Ex. 2 $\frac{\sqrt[3]{162n^5}}{\sqrt[3]{3n^2}} \rightarrow \frac{\sqrt[3]{54n^3}}{\sqrt[3]{1}} = \frac{3n\sqrt[3]{2}}{1} = \boxed{3n\sqrt[3]{2}}$

$\sqrt[3]{54}$
 $\sqrt[3]{27 \cdot 2}$
 \downarrow
 $3\sqrt[3]{2}$

Rationalize Denominators

Another way to simplify a radical expression is to **rationalize the denominator**. You rewrite the expression so that there are no radicals in any denominator and no denominator in any radical.

Multiply by 1.

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

\swarrow
 \searrow
 $\sqrt{4}$

The product of $\sqrt{2}$ and itself is a rational number, 2.

Ex. 3 Simplify.

$$\frac{\sqrt{6} \div 2}{\sqrt{20} \div 2} \rightarrow \frac{\sqrt{3}}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$$

$$\frac{\sqrt{30}}{\sqrt{100}} = \frac{\sqrt{30}}{10}$$

Ex. 4 Simplify.

$$\frac{18}{\sqrt{3x}} \cdot \frac{\sqrt{3x}}{\sqrt{3x}}$$

$$\frac{18\sqrt{3x}}{\sqrt{9x^2}} \rightarrow \frac{18\sqrt{3x}}{3x}$$

$$\frac{6\sqrt{3x}}{x}$$

Ex. 5 Simplify.

$$\frac{\sqrt[3]{14x^2}}{\sqrt[3]{10xy^2}} \xrightarrow{\text{simp.}} \frac{\sqrt[3]{7x}}{\sqrt[3]{5y^2}} \cdot \frac{\sqrt[3]{25y}}{\sqrt[3]{25y}} =$$

$$\frac{\sqrt[3]{175xy}}{\sqrt[3]{125y^3}} \rightarrow \frac{\sqrt[3]{175xy}}{5y}$$

Ex. 6 Simplify.

$$\sqrt[3]{\frac{5x^6}{12x^4y^2z}} \xrightarrow{\text{simp.}} \frac{\sqrt[3]{5x^2}}{\sqrt[3]{12y^2z}} \cdot \frac{\sqrt[3]{18yz^2}}{\sqrt[3]{18yz^2}} =$$

$$\frac{\sqrt[3]{90x^2yz^2}}{6yz}$$

$$\sqrt[3]{216y^3z^3}$$

Answers to HW 3.1A - Day 2 - Dividing Radicals

1. 10
2. $\frac{4x}{y}$
3. $2x^2y^2\sqrt{2}$
4. $5x\sqrt[3]{x^2y^2}$
5. $\frac{\sqrt{2x}}{2}$
6. $\frac{\sqrt[3]{4x}}{2}$
7. $\frac{\sqrt[3]{45x^2}}{3x}$
8. $\frac{\sqrt[4]{250}}{5}$
9. $5x^2\sqrt{5}$
10. $\frac{\sqrt{15y}}{5y}$
11. $\frac{\sqrt[3]{150xy^2z}}{5x}$
12. $\frac{\sqrt[6]{x^4y^3}}{y}$
13. $2xy$
14. $2\sqrt{5}$
15. 4 g/cm^3

