

**Dividing Radicals** → If have  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ , then  $\sqrt[n]{\frac{a}{b}}$  (Note: index numbers must equal!)

\*\*To be simplified when dividing radicals means to have NO RADICALS LEFT IN DENOMINATOR!

\*\*If there is radicals left in the denominator, then you must RATIONALIZE THE DENOMINATOR!

← To get rid of radicals in denominator!

**Example 3: Divide and then simplify the quotient.**

<p>a.) <math>\frac{\sqrt{18x^5}}{\sqrt{2x^3}}</math></p> <p><math>3x</math></p>	<p>b.) <math>\frac{\sqrt{48x^4y^3}}{\sqrt{6xy}}</math></p> <p><math>2xy\sqrt{2x}</math></p>	<p>c.) <math>\frac{\sqrt[3]{250x^7y^3}}{\sqrt[3]{2x^2y}}</math></p> <p><math>5x\sqrt[3]{x^2y^2}</math></p>	<p>d.) <math>\frac{\sqrt[3]{81x^3y^2}}{\sqrt[3]{3x^6y}}</math></p> <p><math>\frac{3\sqrt[3]{y}}{x}</math></p>
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! SEE ATTACHED SHEET FOR WORKED OUT PROBLEMS!

**Rationalizing the Denominator (Just w/ Sq Roots)** → If have  $\frac{1}{\sqrt{a}}$ , then  $\frac{1}{\sqrt{a}} \cdot \frac{\sqrt{a}}{\sqrt{a}} = \frac{\sqrt{a}}{\sqrt{a^2}} = \frac{\sqrt{a}}{a}$

Ex:  $\frac{3}{\sqrt{2}} = \frac{3 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \frac{3\sqrt{2}}{2}$

$\frac{6}{\sqrt{3}} = \frac{6 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$

$\frac{5}{2\sqrt{5}} = \frac{5 \cdot \sqrt{5}}{2\sqrt{5} \cdot \sqrt{5}} = \frac{5\sqrt{5}}{2(5)} = \frac{\sqrt{5}}{2}$

\* A radicand times itself gets rid of the radical.

**Example 4: Divide and then simplify the quotient by rationalizing the denominator.**

<p>a.) <math>\sqrt{\frac{4}{8}}</math></p> <p><math>\frac{\sqrt{2}}{2}</math></p>	<p>b.) <math>\sqrt{\frac{16x^5}{x^6}}</math></p> <p><math>\frac{4\sqrt{x}}{x}</math></p>	<p>c.) <math>\frac{\sqrt{2b}}{\sqrt{3b}} \rightarrow \sqrt{\frac{2b}{3b}}</math></p> <p><math>\frac{\sqrt{6}}{3}</math></p>	<p>d.) <math>\frac{18}{\sqrt{9m^3}}</math></p> <p><math>\frac{6\sqrt{m}}{m^2}</math></p>
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### Example 3

Simplify Radicand

$$a) \frac{\sqrt{18x^5}}{\sqrt{2x^3}} \rightarrow \sqrt{\frac{18x^5}{2x^3}} \rightarrow \sqrt{9x^2} \rightarrow 3x$$

$\begin{matrix} \uparrow \\ 3 & 3 \\ \downarrow \\ 3 \end{matrix} x^2 \rightarrow \frac{2}{2} = 1$

Cannot simplify like it is! Rewrite as 1 radical!

$$b) \frac{\sqrt{48x^4y^3}}{\sqrt{6xy}} \rightarrow \sqrt{\frac{48x^4y^3}{6xy}} \rightarrow \sqrt{8x^3y^2} \rightarrow 2xy\sqrt{2x}$$

$\begin{matrix} \uparrow & & & & \\ 2 & 4 & & & \\ \downarrow & \downarrow & & & \\ 2 & 2 & 2 & & \end{matrix} \quad x^3 \rightarrow \frac{3}{2} = 1r1$   
 $y^2 \rightarrow \frac{2}{2} = 1$

$$c) \frac{\sqrt[3]{250x^7y^3}}{\sqrt[3]{2x^2y}} \rightarrow \sqrt[3]{\frac{250x^7y^3}{2x^2y}} \rightarrow \sqrt[3]{125x^5y^2} \rightarrow 5x\sqrt[3]{x^2y^2}$$

$\begin{matrix} \uparrow \\ 5 & 25 \\ \downarrow \\ 5 & 5 \end{matrix} \quad x^5 \rightarrow \frac{5}{3} = 1r2$   
 $y^2 \rightarrow \frac{2}{3}$



$$d) \frac{\sqrt[3]{81x^3y^2}}{\sqrt[3]{3x^6y}} \rightarrow \sqrt[3]{\frac{81x^3y^2}{3x^6y}} \rightarrow \sqrt[3]{27x^{-3}y} \rightarrow \sqrt[3]{\frac{27y}{x^3}} \rightarrow \frac{\sqrt[3]{27y}}{\sqrt[3]{x^3}} \rightarrow \frac{3\sqrt[3]{y}}{x}$$

$x^3 \rightarrow \frac{3}{3} = 1$   
 $x^3 \rightarrow x x x$

### Example 4

$$a) \sqrt{\frac{4}{8}} \rightarrow \sqrt{\frac{1}{2}} \rightarrow \frac{\sqrt{1}}{\sqrt{2}} \rightarrow \frac{1}{\sqrt{2}} \rightarrow \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \rightarrow \frac{\sqrt{2}}{2}$$

No Radical in denominator

$$b) \sqrt{\frac{16x^5}{x^6}} \rightarrow \sqrt{\frac{16}{x}} \rightarrow \frac{\sqrt{16}}{\sqrt{x}} \rightarrow \frac{4}{\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} \rightarrow \frac{4\sqrt{x}}{x}$$

Example 4 (continued)

$$c) \frac{\sqrt{2b}}{\sqrt{3b}} \rightarrow \sqrt{\frac{2b}{3b}} \rightarrow \sqrt{\frac{2}{3}} \rightarrow \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

↑  
In this form, you still have a radical in the denominator!  
denominator!

$$d) \frac{18}{\sqrt{9m^3}} \rightarrow \frac{18}{3m\sqrt{m}} \rightarrow \frac{6}{m\sqrt{m}} \cdot \frac{\sqrt{m}}{\sqrt{m}} \rightarrow \frac{6\sqrt{m}}{m \cdot m} \rightarrow \frac{6\sqrt{m}}{m^2}$$

$\begin{matrix} \wedge \\ 3 & 3 \\ | \\ 3 \end{matrix} m^3 \rightarrow \frac{3}{2} = 1r1$

Example 5

$$a) \frac{\sqrt[3]{56x^5y^4}}{\sqrt[3]{7x^3y}} \rightarrow \sqrt[3]{\frac{56x^5y^4}{7x^3y}} \rightarrow \sqrt[3]{8x^2y^3} \rightarrow 2y\sqrt[3]{x^2}$$

Simplify

$\begin{matrix} 2 & 4 & & & \\ \wedge & & & & \\ 2 & 2 & & & \\ | & & & & \\ 2 & & & & \end{matrix} \quad \begin{matrix} x^2 \rightarrow \frac{2}{3} \\ y^3 \rightarrow \frac{3}{3} = 1 \end{matrix}$

$$b) \sqrt{\frac{15x^5}{5x^6}} \rightarrow \sqrt{\frac{3}{x}} \rightarrow \frac{\sqrt{3}}{\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} = \frac{\sqrt{3x}}{x}$$

$$c) \frac{\sqrt{54a^5b^3}}{\sqrt{2a^2b}} \rightarrow \sqrt{\frac{54a^5b^3}{2a^2b}} \rightarrow \sqrt{27a^3b^2} \rightarrow 3ab\sqrt{3a}$$

$\begin{matrix} 3 & 9 & & & \\ \wedge & & & & \\ 3 & 3 & & & \\ | & & & & \\ 3 & & & & \end{matrix} \quad \begin{matrix} a^3 \rightarrow \frac{3}{2} = 1r1 \\ b^2 \rightarrow \frac{2}{2} = 1 \end{matrix}$

$$d) \frac{5x}{\sqrt{25x^3}} \rightarrow \frac{5x}{5x\sqrt{x}} \rightarrow \frac{1}{\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} \rightarrow \frac{\sqrt{x}}{x}$$

$\frac{5x}{5x} \rightarrow \frac{1}{1}$