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

**To be underlined 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!

This gets rid of √ in denominator!

Example 3: Divide and then simplify the quotient.

a.) $\dfrac{\sqrt{18x^5}}{\sqrt{2x^3}}$

$3|x|$

b.) $\dfrac{\sqrt{48x^4y^3}}{\sqrt{6xy}}$

$2|xy|\sqrt{2x}$

c.) $\dfrac{\sqrt[3]{250x^7y^3}}{\sqrt[3]{2x^2y}}$

$5x\sqrt[3]{x^2y^2}$

d.) $\dfrac{\sqrt[3]{81x^3y^2}}{\sqrt[3]{3x^6y}}$

$\dfrac{3\sqrt[3]{y}}{x}$

SEE SEPARATE SHEET FOR WORKED OUT EXAMPLES

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

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

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

$\dfrac{5}{2\sqrt{5}} = \dfrac{5}{2\sqrt{5}}\cdot\dfrac{\sqrt{5}}{\sqrt{5}} = \dfrac{5\sqrt{5}}{2(5)} = \dfrac{5\sqrt{5}}{10} = \dfrac{\sqrt{5}}{2}$

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

a.) $\sqrt{\dfrac{4}{8}}$

$\dfrac{\sqrt{2}}{2}$

b.) $\sqrt{\dfrac{16x^5}{x^6}}$

$\dfrac{4\sqrt{x}}{|x|}$

c.) $\dfrac{\sqrt{2b}}{\sqrt{3b}}$

$\dfrac{\sqrt{6}}{3}$

d.) $\dfrac{18}{\sqrt{9m^3}}$

$\dfrac{6\sqrt{m}}{m^2}$

Example 3

<u>SIMPLIFY</u>

a) $\dfrac{\sqrt{18x^5}}{\sqrt{2x^3}} \rightarrow \sqrt{\dfrac{18x^5}{2x^3}} \rightarrow \sqrt{9x^2} \rightarrow \boxed{3|x|}$

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

$x^3 \rightarrow \dfrac{3}{2} = 1\,r\,1$

$y^2 \rightarrow \dfrac{2}{2} = 1$

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

$x^5 \rightarrow \dfrac{5}{3} = 1\,r\,2$

$y^2 = \dfrac{2}{3}$

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

Cannot leave in this form! It is a radical in denominator!

must make into two radicals!

Example 4

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

b) $\sqrt{\dfrac{16x^5}{x^6}} \rightarrow \sqrt{16x^{-1}} \rightarrow \dfrac{\sqrt{16}}{\sqrt{x}} \rightarrow \dfrac{4}{\sqrt{x}} \cdot \dfrac{\sqrt{x}}{\sqrt{x}} \rightarrow \boxed{\dfrac{4\sqrt{x}}{|x|}}$

$\sqrt{\dfrac{16}{x}}$

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

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

Example 5

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

b) $\sqrt{\dfrac{15x^5}{5x^6}} \rightarrow \sqrt{\dfrac{3}{x}} \rightarrow \dfrac{\sqrt{3}}{\sqrt{x}}\cdot\dfrac{\sqrt{x}}{\sqrt{x}} \rightarrow \boxed{\dfrac{\sqrt{3x}}{x}}$

c) $\dfrac{5x}{\sqrt{25x^3}} \rightarrow \dfrac{5x}{5x\sqrt{x}} \rightarrow \dfrac{1}{\sqrt{x}}\cdot\dfrac{\sqrt{x}}{\sqrt{x}} = \boxed{\dfrac{\sqrt{x}}{x}}$

d) $\dfrac{\sqrt{20ab}}{\sqrt{45a^2b^3}} \rightarrow \sqrt{\dfrac{20ab}{45a^2b^3}} \rightarrow \sqrt{\dfrac{4}{9ab^2}} \rightarrow \dfrac{\sqrt{4}}{\sqrt{9ab^2}} \rightarrow \dfrac{2}{3b\sqrt{a}}\cdot\dfrac{\sqrt{a}}{\sqrt{a}} = \boxed{\dfrac{2\sqrt{a}}{3ab}}$

e) $\sqrt[3]{\dfrac{4y^2}{12y}} \rightarrow \sqrt[3]{\dfrac{y}{3}} \rightarrow \dfrac{\sqrt[3]{y}}{\sqrt[3]{3}}\cdot\dfrac{\sqrt[3]{9}}{\sqrt[3]{9}} \rightarrow \dfrac{\sqrt[3]{9y}}{\sqrt[3]{27}} \rightarrow \dfrac{\sqrt[3]{9y}}{3}$

$(\sqrt[3]{3})(\sqrt[3]{3}) = \sqrt[3]{9}$