

Math-1010

Lesson 2-5

Divide Radicals

Quotient Property of Radicals

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Split the radical of a quotient into the quotient of radicals.

$$\sqrt{\frac{26}{4}} \rightarrow \frac{\sqrt{26}}{\sqrt{4}} \rightarrow \frac{\sqrt{26}}{2}$$

This works great if there is a perfect square in the denominator!

$$\sqrt{\frac{5}{9}} \rightarrow \frac{\sqrt{5}}{\sqrt{9}} \rightarrow \frac{\sqrt{5}}{3}$$

$$\frac{\sqrt{12}}{\sqrt{2}} = \sqrt{\frac{12}{2}} = \sqrt{6}$$

A different way to think about it: factor the numerator

$$\frac{\sqrt{12}}{\sqrt{2}} = \frac{\sqrt{2} * \sqrt{6}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{2}} * \frac{\sqrt{6}}{1} = 1 * \frac{\sqrt{6}}{1} = \sqrt{6}$$

Any number divided by itself = ?

Factor the numerator!

$$\frac{\sqrt{12}}{\sqrt{2}} \rightarrow \frac{\sqrt{2} * \sqrt{6}}{\sqrt{2}} \rightarrow \frac{\cancel{\sqrt{2}} * \sqrt{6}}{\cancel{\sqrt{2}}} \rightarrow \sqrt{6}$$

Inverse Property of Multiplication

$$\frac{\sqrt{48x^3}}{\sqrt{16x}} \rightarrow \frac{\sqrt{16x} * \sqrt{3x^2}}{\sqrt{16x}} \rightarrow \sqrt{3x^2} \rightarrow x\sqrt{3}$$

Inverse Property of Multiplication

$$\frac{\sqrt{56x^3y}}{\sqrt{8xy}} \rightarrow \frac{\sqrt{8xy} * \sqrt{7x^2}}{\sqrt{8xy}} \rightarrow \sqrt{7x^2} \rightarrow x\sqrt{7}$$

Inverse Property of Multiplication

Simplify

$$\sqrt{\frac{32}{9x^2}}$$

$$\frac{\sqrt{50y^2}}{\sqrt{2y}}$$

$$\frac{\sqrt{49}}{\sqrt{7}}$$

$$\sqrt{\frac{48}{49}}$$

Rationalizing the denominator: using mathematical properties to change an irrational number (or imaginary) in the denominator into a rational number.

We take advantage of the idea:

$$\sqrt{2} * \sqrt{2} = \sqrt{2*2} = \sqrt{4} = 2$$

$$\sqrt{3} * \sqrt{3} = \sqrt{3*3} = \sqrt{9} = 3$$

$$\frac{1}{\sqrt{2}} * \frac{\sqrt{2}}{\sqrt{2}} \rightarrow \frac{\sqrt{2}}{2}$$

Identity property of multiplication:
multiplying by '1' doesn't change
the number.

Identity
Property of
Multiplication

$$\frac{1}{\sqrt{6}} * \frac{\sqrt{6}}{\sqrt{6}} \rightarrow \frac{\sqrt{6}}{6}$$

$$\frac{2}{\sqrt{6}} * \frac{\sqrt{6}}{\sqrt{6}} \rightarrow \frac{2\sqrt{6}}{6} \rightarrow \frac{\cancel{2} * \sqrt{6}}{\cancel{2} * 3} \rightarrow \frac{\sqrt{6}}{3}$$

$$\frac{25}{\sqrt{15}} * \frac{\sqrt{15}}{\sqrt{15}} \rightarrow \frac{25\sqrt{15}}{15} \rightarrow \frac{\cancel{5} * \cancel{5} * \sqrt{15}}{\cancel{5} * 3} \rightarrow \frac{5\sqrt{15}}{3}$$

$$\frac{14}{3\sqrt{21}} * \frac{\sqrt{21}}{\sqrt{21}} \rightarrow \frac{14\sqrt{21}}{3 * 21} \rightarrow \frac{\cancel{2} * \cancel{7} * \sqrt{21}}{\cancel{3} * \cancel{7} * 3} \rightarrow \frac{7\sqrt{21}}{9}$$

In all of the previous examples we just

$$\frac{3\sqrt{7}}{\sqrt{8}} \rightarrow \frac{3\sqrt{7}}{\sqrt{8}} * \frac{\sqrt{8}}{\sqrt{8}} \rightarrow \frac{3\sqrt{7*2*2*2}}{8} \rightarrow \frac{3*2\sqrt{7*2}}{8}$$

It is easier to simplify
BEFORE you multiply

$$\rightarrow \frac{\cancel{3*2}\sqrt{14}}{\cancel{2*4}}$$

$$\frac{3\sqrt{7}}{\sqrt{8}} \rightarrow \frac{3\sqrt{7}}{\sqrt{4}*\sqrt{2}} \rightarrow \frac{3\sqrt{7}}{2\sqrt{2}} * \frac{\sqrt{2}}{\sqrt{2}} \rightarrow \frac{3\sqrt{14}}{2*2} \rightarrow \frac{3\sqrt{14}}{4}$$

$$\frac{4\sqrt{5}}{\sqrt{12}} \rightarrow \frac{4\sqrt{5}}{\sqrt{4}*\sqrt{3}} \rightarrow \frac{4\sqrt{5}}{2*\sqrt{3}} \rightarrow \frac{\cancel{2}*2*\sqrt{5}}{\cancel{2}*\sqrt{3}} \rightarrow \frac{2\sqrt{5}}{\sqrt{3}} * \frac{\sqrt{3}}{\sqrt{3}} \rightarrow \frac{2\sqrt{15}}{3}$$

What about variables?

$$\frac{3\sqrt{7y}}{\sqrt{5x}} * \frac{\sqrt{5x}}{\sqrt{5x}} \rightarrow \frac{3\sqrt{35xy}}{5x}$$

$$\frac{\sqrt[3]{15}}{\sqrt[3]{5x}} \rightarrow \frac{\cancel{\sqrt[3]{5}} * \sqrt[3]{3}}{\cancel{\sqrt[3]{5}} * \sqrt[3]{x}} \rightarrow \frac{\sqrt[3]{3}}{\sqrt[3]{x}} * \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} \rightarrow \frac{\sqrt[3]{3x^2}}{\sqrt[3]{x^3}} \rightarrow \frac{\sqrt[3]{3x^2}}{x}$$

How many more 'x's
are needed in the
denominator radicand?

Rationalize the denominator

$$\frac{2x}{\sqrt{3x}}$$

$$\frac{3}{\sqrt[4]{x^2}}$$

$$\frac{2\sqrt{3y^3}}{\sqrt{5y}}$$