KEY

Unit 9 Day 3 Notes on Multiplication and Division of Radicals

Two rules:

$\sqrt{ab} = \sqrt{a}\cdot\sqrt{b}$ and $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Examples:

$\sqrt{9\cdot 3} = \sqrt{9}\cdot\sqrt{3}$ and $\sqrt{\frac{25}{3}} = \frac{\sqrt{25}}{\sqrt{3}}$ } could keep going to simplify these

Let's try Multiplying:

$\sqrt{6}\cdot\sqrt{10} = \sqrt{60} = \sqrt{4}\sqrt{15} = \boxed{2\sqrt{15}}$

$2\sqrt{2x^5y^2}\cdot\sqrt{32xy^5} = 2\sqrt{64x^6y^7}$

$2\sqrt{64}\sqrt{x^6}\sqrt{y^6}\sqrt{y}$

$2\cdot 8\cdot x^3\cdot y^3\cdot\sqrt{y}$

$\boxed{16x^3y^3\sqrt{y}}$

What does it mean to 'simplify' when it comes to radical expressions?

Rule	What it looks like
1) You must have the smallest # possible under the radical	$\sqrt{22}$ done! (can't divide by any perfect squares) $\sqrt{20} \to \sqrt{4}\sqrt{5} \to 2\sqrt{5}$ done!
2) You may NOT have a radical in the denominator	$\frac{5}{\sqrt{3}}$* can't leave it this way (see below)
3) You may NOT have like radical factors in the numerator and denominator of a fraction	$\frac{\sqrt{21}}{5\sqrt{3}} = \frac{\sqrt{7}\sqrt{3}}{5\sqrt{3}} = \frac{\sqrt{7}}{5}$ done!

How to we "get rid of" the radical in the denominator?
This process is called Rationalizing the Denominator.

multiply num. and denom by what you want to eliminate

$\frac{21}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \frac{21\sqrt{3}}{3} = \boxed{7\sqrt{3}}$

$\frac{5}{\sqrt{8}}\cdot\frac{\sqrt{8}}{\sqrt{8}} = \frac{5\sqrt{8}}{8} = \frac{5\sqrt{4}\sqrt{2}}{8} = \frac{5\cdot 2\cdot\sqrt{2}}{8}$

$= \frac{10\sqrt{2}}{8} = \boxed{\frac{5\sqrt{2}}{4}}$

Let's try Dividing:

$\frac{5\sqrt{3}}{10\sqrt{15}} = \frac{1\sqrt{1}}{2\sqrt{5}} = \frac{1}{2\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{\sqrt{5}}{10}}$ ($2\sqrt{5}\cdot\sqrt{5} = 5$)

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