Dividing Radicals

Recall: Rational and Irrational numbers

Rational #: decimal ends or repeats (any number which can be written as a fraction)

Ex: $\frac{1}{2}$, $-\frac{3}{4}$, 5, 3.25, $0.3\overline{3}$

Irrational #: decimal never stops or repeats.

Ex: π, $\sqrt{2}$, $\sqrt{5}$, $\sqrt[3]{10}$

when a radical is written in the form $\frac{\sqrt{2}}{\sqrt{3}}$ (or $\sqrt{2} \div \sqrt{3}$) we don't actually divide! The idea is to change the denominator from an irrational number ($\sqrt{3}$) to a rational number. This process is called: Rationalizing the Denominat

Question: How do I change $\sqrt{3}$ to a rational number?

Answer: Multiply it by itself

$$\sqrt{3} \times \sqrt{3} = \sqrt{3 \times 3} = \sqrt{3^2}$$

So to rationalize the denominator we multiply the numerator and denomi by the radical from the denominator

Ex: Simplify: $\dfrac{3\sqrt{5}}{2\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{3\sqrt{10}}{2\sqrt{4}}$

$$= \frac{3\sqrt{10}}{2(2)} = \frac{3\sqrt{10}}{4}$$

NOTE: $\dfrac{\sqrt{a}}{\sqrt{b}} = \sqrt{\dfrac{a}{b}}$, $a \geq 0, b > 0$

Ex: Simplify: $\sqrt{\dfrac{27}{50}} = \dfrac{\sqrt{27}}{\sqrt{50}} = \dfrac{\sqrt{9 \cdot 3}}{\sqrt{25 \cdot 2}}$

$$= \frac{3\sqrt{3}}{5\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{6}}{5\sqrt{4}}$$

$$= \frac{3\sqrt{6}}{10}$$

Ex: Simplify $\dfrac{\sqrt{12}}{\sqrt{3}} = \sqrt{\dfrac{12}{3}} = \sqrt{4} = 2$