1.5B: Working with Radicals - Day 2

Ex. 1 Multiply each of the following:

a) $4\sqrt{5}\left(2\sqrt{8}-3\sqrt{5}\right)$

$= 8\sqrt{40} - 12\cdot 5$

$= 8\sqrt{4}\sqrt{10} - 60$

$= 16\sqrt{10} - 60$

How? Distributive Property.
May need to simplify after multiplying.

b) $\left(2\sqrt{3}-\sqrt{5}\right)\left(4\sqrt{3}+2\sqrt{5}\right)$

$= 8\cdot 3 + 4\sqrt{15} - 4\sqrt{15} - 2\cdot 5$

$= 24 - 10$

$= 14$

$\left\{ +2x - 2x = \emptyset \right.$

c) $\left(2\sqrt{5}-\sqrt{3}\right)^2$

$= \left(2\sqrt{5}-\sqrt{3}\right)\left(2\sqrt{5}-\sqrt{3}\right)$

$= 4\cdot 5 - 2\sqrt{15} - 2\sqrt{15} + 3$

$= 23 - 4\sqrt{15}$

Ex. 2 Simplify each of the following:

BEDMAS

a) $\dfrac{12+3\sqrt{12}}{4}$

How many terms are in the numerator?
Can the 4 be divided out?

$= \dfrac{\cancel{12}^{6}+\cancel{6}^{3}\sqrt{3}}{\cancel{4}_{2}}$

$= \dfrac{\cancel{2}(6+3\sqrt{3})}{\cancel{2}(2)}$

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

$\dfrac{12}{4} + \dfrac{6\sqrt{3}}{4}$

$= 3 + \dfrac{3\sqrt{3}}{2}$

$\dfrac{6}{2} + \dfrac{3\sqrt{3}}{2}$

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

What is the GCF between 4, 6, 12?

b) $\dfrac{15 \pm \sqrt{27}}{3}$ ← Look familiar? In Quad Formula!

$= \dfrac{\cancel{15}^{5} \pm \cancel{3}^{1}\sqrt{3}}{\cancel{3}_{1}}$

$= 5 \pm \sqrt{3}$

Ex. 3 Simplify - Rationalizing Denominators

a) $\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{2\sqrt{5}}{5}$

b) $\frac{3\sqrt{5}}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{3\sqrt{10}}{8}$

c) $\frac{5\sqrt{10}}{15\sqrt{20}} = \frac{1 \cancel{\sqrt{10}}}{3\sqrt{2}\cancel{\sqrt{10}}}$

$= \frac{1}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

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

d) $\frac{1}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}}$

$= \frac{\sqrt[3]{4}}{\sqrt[3]{8}}$

$= \frac{\sqrt[3]{4}}{2}$

e) $\frac{1}{\sqrt[3]{32}}$

$= \frac{1}{\sqrt[3]{8}\sqrt[3]{4}}$

$= \frac{1}{2\sqrt[3]{4}} \cdot \frac{\sqrt[3]{4}}{\sqrt[3]{4}} \cdot \frac{\sqrt[3]{4}}{\sqrt[3]{4}}$

$= \frac{\sqrt[3]{16}}{2 \cdot 4}$

$= \frac{2\sqrt[3]{2}}{8}$

$= \frac{\sqrt[3]{2}}{4}$

What if the denominator is a binomial?

f) $\frac{5}{2\sqrt{6}-\sqrt{3}} \cdot \frac{2\sqrt{6}+\sqrt{3}}{2\sqrt{6}+\sqrt{3}}$

You must multiply by the **conjugate**.

The conjugate of a + b is a - b.
Change the sign between the two terms.

$= \frac{10\sqrt{6}+5\sqrt{3}}{4\cdot 6 + 2\sqrt{18} - 2\sqrt{18} - 3}$

$= \frac{10\sqrt{6}+5\sqrt{3}}{21}$

Why conjugates?
See a familiar pattern?

Difference of Squares

$(a-b)(a+b)$
$= a^2 - b^2$

g) $\frac{(\sqrt{2}+\sqrt{5})}{\sqrt{6}-\sqrt{10}} \cdot \frac{(\sqrt{6}+\sqrt{10})}{\sqrt{6}+\sqrt{10}}$

$= \frac{\sqrt{12}+\sqrt{20}+\sqrt{30}+\sqrt{50}}{6+\cancel{\sqrt{60}}-\cancel{\sqrt{60}}-10}$

$= \frac{2\sqrt{3}+2\sqrt{5}+\sqrt{30}+5\sqrt{2}}{-4}$

$= -\frac{5\sqrt{2}+2\sqrt{3}+2\sqrt{5}+\sqrt{30}}{4}$

Homework:
Handout