1.5B: Working with Radicals - Day 2

Ex. 1 Multiply each of the following:

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

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

$= 16\sqrt{10} - 60$

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

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

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

$= 24 - 10$

$= 14$

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

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

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

$= 20 - 4\sqrt{15} + 3$

$= 23 - 4\sqrt{15}$

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?

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

$= \dfrac{12}{4} + \dfrac{6\sqrt{3}}{4} \Rightarrow = \dfrac{6}{2} + \dfrac{3\sqrt{3}}{2}$

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

What is the GCF between 4, 6, 12?

b) $\dfrac{15 \pm \sqrt{27}}{3}$ ← Look familiar? 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) $\frac{3\sqrt{5}}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{3\sqrt{10}}{4 \cdot 2}$

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

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

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

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

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

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

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

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

What if the denominator is a binomial?

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

$= \dfrac{10\sqrt{6}+5\sqrt{3}}{4 \cdot 6 - 3}$

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

<u>You must multiply by the **conjugate**.</u>

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

Why conjugates?
See a familiar pattern?

Creating a diff. of squares to avoid a middle term in our binomial expansion

$(a-b)\cdot(a+b)$

$= a^2 - b^2$

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

$= \dfrac{\sqrt{12}+\sqrt{20}+\sqrt{30}+\sqrt{50}}{6-10}$

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

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

Homework

Handout