

1.5B: Working with Radicals - Day 2

Ex. 1 Multiply each of the following:

$$\begin{aligned} \text{a) } & 4\sqrt{5}(2\sqrt{8}-3\sqrt{5}) \\ & = 8\sqrt{40} - 12 \cdot 5 \\ & = 16\sqrt{10} - 60 \end{aligned}$$

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

$$\begin{aligned} \text{b) } & (2\sqrt{3}-\sqrt{5})(4\sqrt{3}+2\sqrt{5}) \\ & = 8 \cdot 3 + 4\sqrt{15} - 4\sqrt{15} - 2 \cdot 5 \\ & = 24 - 10 \\ & = 14 \end{aligned}$$

$$\begin{aligned} \text{c) } & (2\sqrt{5}-\sqrt{3})^2 \\ & = (2\sqrt{5}-\sqrt{3})(2\sqrt{5}-\sqrt{3}) \\ & = 4 \cdot 5 - 2\sqrt{15} - 2\sqrt{15} + 3 \\ & = 20 - 4\sqrt{15} + 3 \\ & = 23 - 4\sqrt{15} \end{aligned}$$

Ex. 2 Simplify each of the following:



BEDMAS

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

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

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

How many terms are in the numerator?

Can the 4 be divided out?

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

What is the GCF between 4, 6, 12?

b) $\frac{15 \pm \sqrt{27}}{3}$

$$= \frac{\overset{5}{\cancel{15}} \pm \overset{3}{\cancel{3}}\sqrt{3}}{\cancel{3}}$$

$$= 5 \pm \sqrt{3}$$



Look familiar?

Quad formula!

Ex. 3 Simplify - Rationalizing Denominators

$$\begin{aligned} \text{a) } \frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} \\ = \frac{2\sqrt{5}}{5} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{3\sqrt{5}}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ = \frac{3\sqrt{10}}{4 \cdot 2} \\ = \frac{3\sqrt{10}}{8} \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{\cancel{5}\sqrt{10}}{\cancel{3}\cancel{15}\sqrt{20}} &= \frac{\cancel{\sqrt{10}}}{3\sqrt{2}\cancel{\sqrt{10}}} \\ &= \frac{1}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{2}}{6} \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{1}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} \\ = \frac{\sqrt[3]{2 \cdot 2}}{2} \\ = \frac{\sqrt[3]{4}}{2} \end{aligned}$$

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

What if the denominator is a binomial?

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

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

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

You must multiply by the **conjugate**.

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

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

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

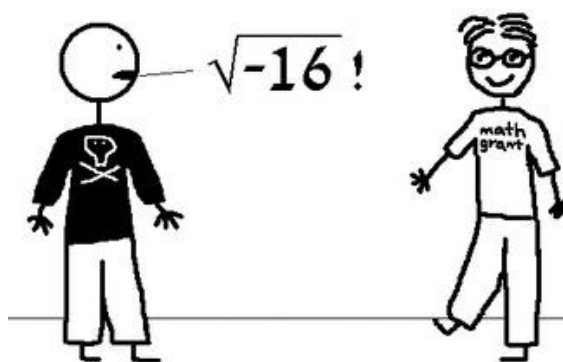
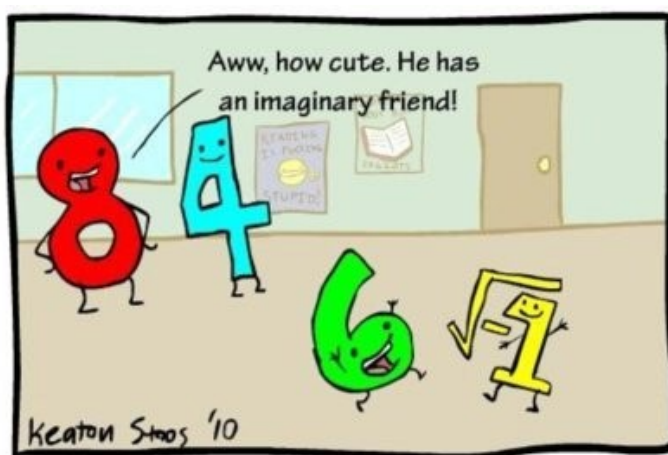
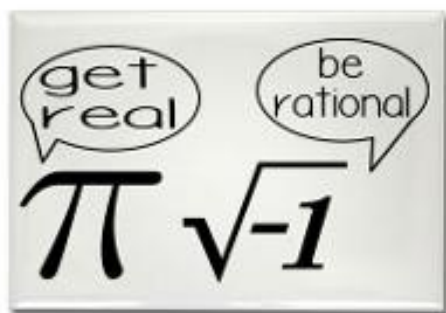
$$= \frac{\sqrt{12} + \sqrt{20} + \sqrt{30} + \sqrt{50}}{6 - 10}$$

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

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

Homework

Handout



Mathematical Insults