

7.3 - Multiplying Radical Expressions

Note Title

Examine

$$\sqrt{9 \cdot 16} \text{ vs. } \sqrt{9} \cdot \sqrt{16} \quad \neq \quad \sqrt{9+16} \text{ vs. } \sqrt{9} + \sqrt{16}$$

The Product Rule for Radicals For any real numbers $\sqrt[n]{a}$ and $\sqrt[n]{b}$,

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}.$$

(The product of two n th roots is the n th root of the product of the two radicands.)

① Multiply

a) $\sqrt{5} \cdot \sqrt{6}$

b) $\sqrt{x-4} \cdot \sqrt{x+4}$

c) $\sqrt{2} \cdot \sqrt{8}$

d) $\sqrt[3]{9} \cdot \sqrt[3]{3}$

Using the Product Rule to Simplify

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}.$$

($\sqrt[n]{a}$ and $\sqrt[n]{b}$ must both be real numbers.)

Ex: $\sqrt{50}$

"jail story"

To Simplify a Radical Expression with Index n by Factoring

1. Express the radicand as a product in which one factor is the largest perfect n th power possible.
2. Take the n th root of each factor.
3. Simplification is complete when no radicand has a factor that is a perfect n th power.

② Simplify

a) $\sqrt{27}$

b) $\sqrt[3]{40}$

c) $\sqrt[4]{162}$

d) $\sqrt{169p^4r^6}$

$$f) \sqrt{81y^5}$$

$$g) \sqrt{32xy^2}$$

$$h) \sqrt[4]{32z^7}$$

$$i) \sqrt[3]{24a^9b^4}$$

you try

$$\sqrt[3]{108x^{14}y^{27}z^{34}}$$

$$\textcircled{3} \text{ Simplify } f(x) = \sqrt{2x^2 - 8x + 8}$$

④ Multiply & Simplify

a) $\sqrt{10} \cdot \sqrt{14}$

b) $\sqrt[3]{4} \cdot \sqrt[3]{20}$

c) $\sqrt[4]{4a^3b^5} \cdot \sqrt[4]{20a^2b^7}$