

Multiplying, Dividing, and Simplifying Radicals

Product Rule for Radicals

$$\sqrt{a} \cdot \sqrt{b} = \sqrt{ab} \quad \text{and} \quad \sqrt{ab} = \sqrt{a} \cdot \sqrt{b} \quad (\text{Note: only true when } a \geq 0 \text{ and } b \geq 0)$$

Ex 1.

$$\sqrt{7} \cdot \sqrt{5} =$$

$$\sqrt{11} \cdot \sqrt{11} =$$

$$\sqrt{7} \cdot \sqrt{k} =$$

Simplifying Radicals

4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, ... are _____ (since $4 = 2^2$, $9 = 3^2$, ...)

8, 27, 64, 125, 216, 343, ... are _____ (since $8 = 2^3$, $27 = 3^3$, ...)

16, 81, 256, 625, ... are _____ (since $16 = 2^4$, $81 = 3^4$, ...)

Ex 2.

Simplify:

$$\sqrt{80} =$$

$$\sqrt{72} =$$

Ex 3.

Multiply and simplify.

$$\sqrt{6} \cdot \sqrt{30} =$$

$$3\sqrt{5} \cdot 4\sqrt{10} =$$

$$\sqrt{8} \cdot \sqrt{12} =$$

Quotient Rule for Radicals

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \quad \text{and} \quad \frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}} \quad (\text{Note: only true when } a \geq 0 \text{ and } b \geq 0)$$

Ex 4.

Simplify.

$$\sqrt{\frac{25}{9}} =$$

$$\frac{\sqrt{288}}{\sqrt{2}} =$$

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

$$\frac{8\sqrt{50}}{4\sqrt{5}} =$$

$$\sqrt{\frac{3}{8}} \cdot \sqrt{\frac{7}{2}} =$$

Ex 5.

Simplify. Assume that all variables represent nonnegative real numbers.

$$\sqrt{16x^8} =$$

$$\sqrt{x^5} =$$

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

Note: $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ and $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$

Ex 6.

Simplify.

$$\sqrt[3]{40} =$$

$$\sqrt[4]{32} =$$

$$\sqrt[3]{\frac{27}{125}} =$$

$$\sqrt[3]{x^6} =$$

$$\sqrt[3]{27x^{12}} =$$

$$\sqrt[3]{32x^4} =$$

$$\sqrt[3]{\frac{x^{15}}{1000}} =$$

Practice

1. Simplify.

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

b) $\sqrt{64}$

c) $6\sqrt{40}$

d) $\sqrt{50} \cdot \sqrt{72}$

e) $\frac{\sqrt{200}}{\sqrt{2}}$

f) $\sqrt{\frac{14}{72}}$

g) $\sqrt{50x^{20}}$

h) $\sqrt[3]{192}$

i) $\sqrt[4]{243}$

j) $\sqrt[3]{125x^{15}}$

k) $\sqrt[3]{24x^4}$

Q: April says May is a liar. May says June is a liar. June says April and May are both liars. If only one person is telling the truth, who is it?