

Multiplying and Simplifying Radical Expressions

Product Rule for Radicals

$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ (Disclaimer: Only works when $\sqrt[n]{a}, \sqrt[n]{b}$ are real #s. Some restrictions apply. See stores for details.)

Ex 1.

Multiply:

$$\sqrt[3]{7} \cdot \sqrt[3]{9} =$$

$$\sqrt{x+2} \cdot \sqrt{x-2} =$$

Simplifying Radicals

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

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

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

Ex 2.

Simplify:

$$\sqrt{80} =$$

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

$$\sqrt{200x^2y} =$$

$$\sqrt{3x^2 - 12x + 12} =$$

Recall: If n is even, $\sqrt[n]{a^n} = |a|$. If n is odd, $\sqrt[n]{a^n} = a$.

Note: If a is nonnegative, then the first rule becomes $\sqrt[n]{a^n} = \underline{\hspace{2cm}}$.

Ex 3.

Simplify (assume that all variables are positive real numbers).

$$\sqrt{x^6} =$$

$$\sqrt{x^7 y^{11} z^3} =$$

$$\sqrt[3]{40x^{10}y^{14}} =$$

$$\sqrt[5]{32x^{12}y^2z^8} =$$

Ex 4.

Multiply and simplify (assume that all variables are positive real numbers):

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

$$10\sqrt[3]{16} \cdot 5\sqrt[3]{2} =$$

$$\sqrt[4]{4x^2y} \cdot \sqrt[4]{8x^6y^3} =$$

Practice

1. Multiply:

a) $\sqrt[4]{6x^2} \cdot \sqrt[4]{3x}$

b) $\sqrt[6]{x-5} \cdot \sqrt[6]{(x-5)^4}$

2. Simplify by factoring:

a) $\sqrt{40x}$

b) $\sqrt[3]{-250x^3}$

3. Express $f(x)$ in simplest form (assume that x can be any real number).

a) $f(x) = \sqrt[3]{48(x-2)^3}$

b) $f(x) = \sqrt{5x^2 - 10x + 5}$

4. Simplify (assume that all variables are positive real numbers).

a) $\sqrt{x^6y^7}$

b) $\sqrt[3]{27x^3y^{17}z^2}$

c) $\sqrt[3]{32x^9y^{17}}$

d) $\sqrt[4]{96x^{11}}$

5. Multiply and simplify (assume that all variables are positive real numbers):

a) $\sqrt{3} \cdot \sqrt{6}$

b) $\sqrt{5xy} \cdot \sqrt{10xy^2}$

c) $\sqrt[4]{4x^2y^3z^3} \cdot \sqrt[4]{8x^4yz^6}$

d) $\sqrt[3]{(x-5)} \cdot \sqrt[3]{(x-5)^7}$

e) $(5a^2b\sqrt[4]{8a^2b})(4ab\sqrt[4]{4a^3b^2})$

Q: There is a word in the English language in which the first two letters signify a male, the first three letters signify a female, the first four signify a great man, and the whole word, a great woman. What is the word?