Adding, Subtracting, and Multiplying Radical expressions

Product Property of Radicals

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, and $n \geq 2$ is an integer, then

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

We can prove this using rational exponents.

Note: $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$

Simplify

$\sqrt{5} \cdot \sqrt{3} = \sqrt{15}$

$\sqrt[3]{2} \cdot \sqrt[3]{13} = \sqrt[3]{26}$

xy

$\sqrt{4} + \sqrt{36} = \sqrt{40}$

$2 + 6 = 8$

$x + y$

$\sqrt{3} + \sqrt{5}$

Multiply

$\sqrt[5]{6c} \cdot \sqrt[5]{7c^2} = \sqrt[5]{42c^3}$

You try

$\sqrt{11} \cdot \sqrt{7} = \sqrt{77}$

$\sqrt[4]{6} \cdot \sqrt[4]{7} \quad \sqrt[4]{42}$

$\sqrt[7]{5p} \cdot \sqrt[7]{4p^3} \quad \sqrt[7]{20p^4}$

Multiply and Simplify ~~Assuming all variables are greater than or equal to zero~~

$\sqrt{3} \cdot \sqrt{15}$

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

$\sqrt[4]{27a^2b^5} \cdot \sqrt[4]{6a^3b^6}$

You try

$\sqrt{6} \cdot \sqrt{8}$

$4\sqrt[3]{8a^2b^5} \cdot \sqrt[3]{6a^2b^4}$

What is inside radical DOES NOT CHANGE (+ & −)

Add the following

$$5\sqrt{2x}+9\sqrt{2x} = 14\sqrt{2x}$$

$$3\sqrt[3]{10}+7\sqrt[3]{10}-5\sqrt[3]{10} = 5\sqrt[3]{10}$$

You Try

$$9\sqrt{13y}+4\sqrt{13y} \quad 13\sqrt{13y}$$

$$\sqrt[4]{5}+9\sqrt[4]{5}-3\sqrt[4]{5} = 7\sqrt[4]{5}$$

Add or subtract as indicated.

$$3\sqrt{12}+7\sqrt{3}$$

$12 = 4 \cdot 3$

$3 \cdot 2\sqrt{3}$

$6\sqrt{3}+7\sqrt{3} = 13\sqrt{3}$

Add or subtract as indicated.

$$3x\sqrt{20x}-7\sqrt{5x^3}$$

$20x = 4 \cdot 5 \cdot x$

$3x \cdot 2\sqrt{5x}$

$6x\sqrt{5x} - 7x\sqrt{5x} = -x\sqrt{5x}$

$$3\sqrt{5}+7\sqrt{13}$$

You try

$$7\sqrt{10} - 6\sqrt{3}$$

$$4\sqrt{14} - 3\sqrt{8}$$

$$-5x\sqrt[3]{54x} + 7\sqrt[3]{2x^4}$$

Add or subtract as indicated.

$$\sqrt[3]{16x^4} - 7x\sqrt[3]{-2x} + \sqrt[3]{54x}$$

You try

$$\sqrt[3]{8z^4} - 2z\sqrt[3]{-27z} + \sqrt[3]{125z}$$

Multiply and simplify

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

$$\sqrt[3]{2}\left(3 + \sqrt[3]{4}\right)$$

You try

$$\sqrt{6}\left(3-5\sqrt{6}\right)$$

$$\sqrt[3]{12}\left(3-\sqrt[3]{2}\right)$$