

## Adding Radicals

Friday, February 14, 2020

10:39 AM

$$3x + 5x = 8x$$

$$3\sqrt{3} + 5\sqrt{3} = 8\sqrt{3}$$

$$\sqrt{27} + \sqrt{75} \stackrel{?}{=} \sqrt{102}$$

$$5.196 + 8.660 \stackrel{?}{=} 10.0995$$

$$13.856 \neq 10.0995$$

Can't add  
insides

$$5x + 7y \neq 12xy$$

not like terms, so can't simplify

$$5\sqrt{3} + 7\sqrt{2} \neq 12\sqrt{5}$$

not like radicals

We can only add/subtract like radicals

$$3\sqrt{2x}^z \text{ and } -3\sqrt{2x}^z \checkmark \text{ Like radicals}$$

$$3z + -3z = 0$$

$$2\sqrt{2x} \text{ and } 5\sqrt{2x^2} \times \text{ not like radicals}$$

Ex 1 Simplify

$$\begin{aligned} \text{a) } \sqrt{27} + \sqrt{12} &= \sqrt{3^3} + \sqrt{2^2 \cdot 3} \\ &= 3\sqrt{3} + 2\sqrt{3} \\ &= \underline{5\sqrt{3}} \end{aligned}$$

*Factorization diagrams:*  
27: 3 → 9 → 3, 3  
12: 4 → 3 → 2, 2

$$\text{b) } \sqrt[3]{16} - \sqrt[3]{24} - \sqrt[3]{54}$$

*Factorization diagrams:*  
16: 4 → 2, 2 → 2, 2  
24: 4 → 2, 2 → 2, 2 → 6 → 2, 3  
54: 27 → 3, 3 → 3, 3

at minimum

$$= \sqrt[3]{2^4} - \sqrt[3]{2^3 \cdot 3} - \sqrt[3]{27 \cdot 2}$$

$$= \underline{2\sqrt[3]{2}} - 2\sqrt[3]{3} - \underline{3\sqrt[3]{2}}$$

$$= -\sqrt[3]{2} - 2\sqrt[3]{3}$$

$$c) \sqrt[3]{32x^5} - x\sqrt[3]{4x^2}$$

$\begin{array}{c} \wedge \\ 4 \quad 8 \\ \wedge \quad \wedge \\ 2 \quad 2 \quad 2 \quad 4 \\ \wedge \quad \wedge \\ \quad 2 \quad 2 \end{array}$

$$= \sqrt[3]{2^5 \cdot x^3 \cdot x^2} - x\sqrt[3]{2^2 \cdot x^2}$$

$$= 2x \sqrt[3]{2^2 \cdot x^2} - x \sqrt[3]{2^2 \cdot x^2} = 2xz - xz$$

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

$$= xz$$

$$d) \sqrt{32x} + \sqrt{48y} - \sqrt{12x} + \sqrt{27y}$$

$\begin{array}{c} \wedge \quad \wedge \\ 4 \quad 12 \\ \wedge \quad \wedge \\ 2 \quad 2 \quad 2 \quad 6 \\ \wedge \\ \quad 2 \quad 3 \end{array}$

$$= \sqrt{2^5 \cdot x} + \sqrt{2^4 \cdot 3y} - \sqrt{4 \cdot 3 \cdot x} + \sqrt{9 \cdot 3 \cdot y}$$

$$= 4\sqrt{2x} + \underline{4\sqrt{3y}} - 2\sqrt{3x} + \underline{3\sqrt{3y}}$$

$$= \underline{4\sqrt{2x} + 7\sqrt{3y} - 2\sqrt{3x}}$$