

# Adding and Subtracting Radicals

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## Add/Subtract Radical Expressions

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- A radical expression is an algebraic expression that contains radicals.
- To add radical expressions, we need to review how to add like terms.

$$\underline{2x} + \underline{3x} = 5x$$

$$\underline{2\sqrt{5}} + \underline{3\sqrt{5}} = 5\sqrt{5}$$

## How to Add/Subtract Radicals

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- We can only add/subtract like radicals.
- Like radicals are radicals with the same radicand and same index.
- To add/subtract like radicals, add/subtract the coefficients and keep the radical the same.

## Examples

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$$3\sqrt{7} - \sqrt{7} = 3\sqrt{7} - 1\sqrt{7} = 2\sqrt{7}$$

$$\sqrt{6} + \sqrt{6} = 1\sqrt{6} + 1\sqrt{6} = 2\sqrt{6}$$

$$\underline{\underline{\sqrt{6} + \sqrt{5}}} \quad x + y$$

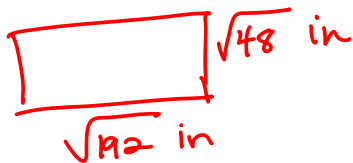
## More Examples Simplify 1st

$$\begin{aligned}4\sqrt{32} - 2\sqrt{8} &= 4\sqrt{16 \cdot 2} - 2\sqrt{4 \cdot 2} \\ &= 4(4)\sqrt{2} - 2(2)\sqrt{2} \\ &= 16\sqrt{2} - 4\sqrt{2} = 12\sqrt{2}\end{aligned}$$

$$\begin{aligned}\sqrt[3]{16} + 4\sqrt[3]{54} &= \sqrt[3]{8 \cdot 2} + 4\sqrt[3]{27 \cdot 2} \\ 1, 8, 27, 64, \dots &= 2\sqrt[3]{2} + 4(3)\sqrt[3]{2} \\ &= 2\sqrt[3]{2} + 12\sqrt[3]{2} = 14\sqrt[3]{2}\end{aligned}$$

$$\begin{aligned}2\sqrt{5} + 3\sqrt{20} + 4\sqrt{45} &= 2\sqrt{5} + 3\sqrt{4 \cdot 5} + 4\sqrt{9 \cdot 5} \\ &= 2\sqrt{5} + 3(2)\sqrt{5} + 4(3)\sqrt{5} \\ &= 2\sqrt{5} + 6\sqrt{5} + 12\sqrt{5} = 20\sqrt{5}\end{aligned}$$

## Application - Perimeter



$$P = 2l + 2w$$

$$P = 2\sqrt{12} + 2\sqrt{48}$$

$$\begin{aligned}P &= 2\sqrt{64 \cdot 3} + 2\sqrt{16 \cdot 3} = 2(8)\sqrt{3} + 2(4)\sqrt{3} \\ &= 16\sqrt{3} + 8\sqrt{3} \\ &= 24\sqrt{3}\end{aligned}$$