

Adding & Subtracting Radicals

Radicals with the same radicand and index are called like radicals

Just like algebraic expressions, we can combine them by adding & subtracting.

e.g. $(5x + 8y) + (14x + 25 + 20y)$

$$19x + 12y + 25 \quad \text{don't change to } x^2!$$

Example 1: simplify:

a) $4\sqrt{5} + 2\sqrt{6} - 8\sqrt{6} + \sqrt{5}$

$$5\sqrt{5} + -6\sqrt{6} \quad \text{done}$$

b) $4\sqrt{5} + 5\sqrt{20} - \sqrt{125}$

→ we must change these to like radicals

$$\begin{array}{c} \downarrow \quad \downarrow \\ 5 \cdot 2\sqrt{5} - 5\sqrt{5} \end{array}$$

$$4\sqrt{5} + 10\sqrt{5} - 5\sqrt{5} \longrightarrow \underline{\underline{9\sqrt{5}}}$$

c) $3\sqrt[3]{54} + 5\sqrt[3]{16} - \sqrt[3]{50}$

$$3 \cdot 3 \cdot \sqrt[3]{2} + 5 \cdot 2 \cdot \sqrt[3]{2} - \sqrt[3]{50}$$

$$\underbrace{\hspace{10em}}$$

$$19 \cdot \sqrt[3]{2} - \sqrt[3]{50}$$

d) $28\sqrt{8x^3} - \sqrt{2x} + 4x\sqrt{50x}$

$$28\sqrt{4}\sqrt{x^2}\sqrt{2x} - \sqrt{2x} + 4x\sqrt{25}\sqrt{2x}$$

$$56x\sqrt{2x} - 1\sqrt{2x} + 20x\sqrt{2x}$$

$$76x\sqrt{2x} - 1\sqrt{2x} \longrightarrow (76x - 1)\sqrt{2x}$$

Example 2: Simplify:

a) $8\sqrt{7} + 2\sqrt{28}$

$$8\sqrt{7} + 2 \cdot 2\sqrt{7}$$

$$12\sqrt{7}$$

e) $3\sqrt{50} - 2\sqrt{32}$

$$3 \cdot 5\sqrt{2} - 2 \cdot 4\sqrt{2}$$

$$7\sqrt{2}$$

b) $5\sqrt{28} + 6\sqrt{63} - 7\sqrt{7}$

$$5 \cdot 2\sqrt{7} + 6 \cdot 3\sqrt{7} - 7\sqrt{7}$$

$$21\sqrt{7}$$

f) $8\sqrt{8xy} + 5\sqrt{18yx^3}$

$$8 \cdot 2\sqrt{2xy} + 5 \cdot 3x\sqrt{2xy}$$

$$16\sqrt{2xy} + 15x\sqrt{2xy}$$

$$(16 + 15x)\sqrt{2xy}$$

c) $4\sqrt{3} + 3\sqrt{20} - 2\sqrt{12} + \sqrt{45}$

$$4\sqrt{3} + 6\sqrt{5} - 4\sqrt{3} + 3\sqrt{5}$$

$$9\sqrt{5}$$

g) $3x\sqrt[3]{32} + 2y\sqrt[3]{108}$

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

$$6x \cdot \sqrt[3]{4} + 6y \cdot \sqrt[3]{4}$$

$$(6x + 6y)(\sqrt[3]{4})$$

d) $-5\sqrt{44x^2} + 2x\sqrt{99}$

$$-5(2x)\sqrt{11} + 2x(3)\sqrt{11}$$

$$-10x\sqrt{11} + 6x\sqrt{11}$$

$$4x\sqrt{11}$$

h) $19\sqrt{27} + 2x\sqrt{48}$

$$19 \cdot 3\sqrt{3} + 2x \cdot 4\sqrt{3}$$

$$57\sqrt{3} + 8x\sqrt{3}$$

$$(57 + 8x)\sqrt{3}$$

Assignment: please add on p.279# 8-10, 15, 16, 23, 25