

2.0 Add and Subtract Radicals

Math 20-2

Radicals

Objective: Add and Subtract Radicals.

Skill Review:

- Adding Fractions (add same size)

$$\frac{3x}{3x} \frac{3}{4} + \frac{1}{6} \frac{x \cdot 2}{x \cdot 2} = \frac{9}{12} + \frac{2}{12} = \frac{11}{12}$$

- Simplifying Polynomials (add same size, like terms)

$$\underline{3a} + \underline{4b} + \underline{7a} + \underline{2b} = 10a + 6b$$

- Mixed Radicals (express as a mixed radical in simplest terms)

$$\begin{aligned}\sqrt{24} &= \sqrt{4 \times 6} \\ &= \sqrt{4} \sqrt{6} \\ &= 2\sqrt{6}\end{aligned}$$

$$\begin{aligned}\sqrt{18} &= \sqrt{9 \times 2} \\ &= \sqrt{9} \sqrt{2} \\ &= 3\sqrt{2}\end{aligned}$$

Examples: Adding and Subtracting Radical (add same sizes, like radicals in lowest terms):

$$1. \quad \underline{5\sqrt{2}} + \underline{\sqrt{3}} + \underline{6\sqrt{2}} - \underline{5\sqrt{3}} = 11\sqrt{2} - 4\sqrt{3}$$

$$2. \quad 3\sqrt{6} + 2\sqrt{5} + \sqrt{24} - 3\sqrt{20}$$

$$\begin{aligned}&= 3\sqrt{6} + 2\sqrt{5} + \sqrt{4}\sqrt{6} - 3\sqrt{4}\sqrt{5} \\ &= 3\sqrt{6} + 2\sqrt{5} + 2\sqrt{6} - 3(2)\sqrt{5} \\ &= \underline{3\sqrt{6}} + \underline{2\sqrt{5}} + \underline{2\sqrt{6}} - \underline{6\sqrt{5}} \\ &= 5\sqrt{6} - 4\sqrt{5}\end{aligned}$$

2.0 Add and Subtract Radicals

Math 20-2

Radicals

On your own:

Adding and Subtracting Radical (add same sizes, like radicals in lowest terms):

3. $4\sqrt{2} + 5\sqrt{3} + 8\sqrt{2} - 10\sqrt{3}$

$$= 12\sqrt{2} - 5\sqrt{3}$$

4. $4\sqrt{2} + 5\sqrt{3} + \sqrt{18} + 4\sqrt{12}$

$$= 4\sqrt{2} + 5\sqrt{3} + \sqrt{9}\sqrt{2} + 4\sqrt{4}\sqrt{3}$$

$$= 4\sqrt{2} + 5\sqrt{3} + 3\sqrt{2} + 4(2)\sqrt{3}$$

$$= 4\sqrt{2} + 5\sqrt{3} + 3\sqrt{2} + 8\sqrt{3}$$

$$= 7\sqrt{2} + 13\sqrt{3}$$

2.0 Add and Subtract Radicals

Math 20-2

Radicals

Build Your Skills

1. Write each expression in terms of a single radical, if possible.

$$a) 2\sqrt{3} + 3\sqrt{3}$$

$$= 5\sqrt{3}$$

$$b) 6\sqrt{2} - 4\sqrt{2} + \sqrt{2}$$

$$= 3\sqrt{2}$$

$$c) 4\sqrt{25} + 2\sqrt{100}$$

$$= 4(5) + 2(10)$$

$$= 20 + 20$$

$$= 40$$

2. Determine an equivalent form for each expression.

$$a) \sqrt{24} + \sqrt{54}$$

$$= \sqrt{4\sqrt{6}} + \sqrt{9\sqrt{6}}$$

$$= 2\sqrt{6} + 3\sqrt{6}$$

$$= 5\sqrt{6}$$

$$b) 5\sqrt{20} + \sqrt{162} - 2\sqrt{45} + 3\sqrt{5}$$

$$= 5\sqrt{4\sqrt{5}} + \sqrt{81\sqrt{2}} - 2\sqrt{9\sqrt{5}} + 3\sqrt{5}$$

$$= 5(2)\sqrt{5} + 9\sqrt{2} - 2(3)\sqrt{5} + 3\sqrt{5}$$

$$= 10\sqrt{5} + 9\sqrt{2} - 6\sqrt{5} + 3\sqrt{5}$$

$$= 7\sqrt{5} + 9\sqrt{2}$$

$$c) \sqrt{18} - \sqrt{2}$$

$$= \sqrt{9\sqrt{2}} - \sqrt{2}$$

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

$$= 2\sqrt{2}$$

$$d) 2\sqrt{98} + \sqrt{10} - 5\sqrt{8} - 3\sqrt{40}$$

$$= 2\sqrt{49\sqrt{2}} + \sqrt{10} - 5\sqrt{4\sqrt{2}} - 3\sqrt{4\sqrt{10}}$$

$$= 2(7)\sqrt{2} + \sqrt{10} - 5(2)\sqrt{2} - 3(2)\sqrt{10}$$

$$= 14\sqrt{2} + \sqrt{10} - 10\sqrt{2} - 6\sqrt{10}$$

$$= 4\sqrt{2} - 5\sqrt{10}$$

$$e) \sqrt[3]{162} + \sqrt[3]{48} - \sqrt[3]{16}$$

$$= \sqrt[3]{27\sqrt{6}} + \sqrt[3]{8\sqrt{6}} - \sqrt[3]{8\sqrt{2}}$$

$$= 3\sqrt[3]{6} + 2\sqrt[3]{6} - 2\sqrt[3]{2}$$

$$= 5\sqrt[3]{6} - 2\sqrt[3]{2}$$

$$f) \sqrt[3]{8} - \sqrt[3]{27} + \sqrt[3]{72}$$

$$= 2 - 3 + \sqrt[3]{8\sqrt[3]{9}}$$

$$= 2 - 3 + 2\sqrt[3]{9}$$

$$= -1 + 2\sqrt[3]{9}$$