

5.2 Multiplying and Dividing Radical Expressions (I)

When multiplying radical expressions we:

- 1) Multiply coefficients
- 2) Multiply radicands

Note: There are 2 ways to multiply radicals

Example: Simplify.

a) $(2\sqrt{7})(4\sqrt{75})$

Method 1: Multiply, then simplify

$$\begin{aligned} &= 2 \cdot 4 \sqrt{7 \cdot 75} \\ &= 8 \sqrt{525} \\ &= 40 \sqrt{21} \end{aligned}$$

Method 2: Simplify, then multiply

$$\begin{aligned} &2\sqrt{7} \cdot 20\sqrt{3} \\ &= 40\sqrt{21} \end{aligned}$$

This method seems easier.

b) $(-4\sqrt{20})(2\sqrt{50})$

$$\begin{aligned} &= -8\sqrt{5} \cdot 10\sqrt{2} \\ &= -80\sqrt{10} \end{aligned}$$

c) $\sqrt[3]{16x^2} \cdot 5\sqrt[3]{x^5}$

$$\begin{aligned} &= 2^3\sqrt[3]{2x^2} \cdot 5x\sqrt[3]{x^2} \\ &= 10x \cdot \sqrt[3]{2x^4} \\ &= 10x^2\sqrt[3]{2x} \end{aligned}$$

d) $7\sqrt{3}(5\sqrt{5}-6\sqrt{3})$ *distributive property*

$$\begin{aligned} &= 35\sqrt{15} - 42\sqrt{9} \\ &= 35\sqrt{15} - 126 \end{aligned}$$

e) $\sqrt{5}(2\sqrt{2}+\sqrt{3}-4)+\sqrt{10}$

$$\begin{aligned} &= \underbrace{2\sqrt{10}} + \sqrt{15} - 4\sqrt{5} + \underbrace{\sqrt{10}} \\ &= 3\sqrt{10} + \sqrt{15} - 4\sqrt{5} \end{aligned}$$

$$f) (8\sqrt{2}-5)(9\sqrt{5}+6\sqrt{10})$$

$$= 72\sqrt{10} + 48\sqrt{20} - 45\sqrt{5} - 30\sqrt{10}$$

$$= 42\sqrt{10} + 96\sqrt{5} - 45\sqrt{5}$$

$$= 42\sqrt{10} + 51\sqrt{5}$$

$$g) (2\sqrt{5}+3)^2$$

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

$$= 4\sqrt{25} + 6\sqrt{5} + 6\sqrt{5} + 9$$

$$= 20 + 12\sqrt{5} + 9$$

$$= 29 + 12\sqrt{5}$$

$$h) (a\sqrt{36}+a)(9-a\sqrt{3})$$

$$= (6a+a)(9-a\sqrt{3})$$

$$= 7a(9-a\sqrt{3})$$

$$= 63a - 7a^2\sqrt{3}, a \in \mathbb{R}$$

$$i) -2\sqrt{11c}(4\sqrt{2c^3}-3\sqrt{3})$$

$$= -2\sqrt{11c}(4c\sqrt{2c}-3\sqrt{3})$$

$$= -8c\sqrt{22c^2} + 6\sqrt{33c}$$

$$= -8c^2\sqrt{22} + 6\sqrt{33c}$$