

Today's Learning Goal(s):

Date: Mar. 20/17

By the end of the class, I will be able to:

- simplify a radical.
- multiply, add and subtract radical expressions.

Last day's work:

pp. 160-162 #1 – 5, 7, 9, 13 [17]

4d 13d

3.4 Operations with Radicals

Date: Mar-20/17

Recall: When working with radicals all answers must be in lowest terms.

Look for factors of the radicand that are perfect squares!

Ex.1: Simplify

Entire radical

$$\begin{aligned} \text{a) } \sqrt{50} \\ &= \sqrt{25} \sqrt{2} \\ &= 5\sqrt{2} \end{aligned}$$

Mixed radical

$$\begin{aligned} \text{b) } 5\sqrt{45} \\ &= 5\sqrt{9} \sqrt{5} \\ &= 5(3)\sqrt{5} \\ &= 15\sqrt{5} \end{aligned}$$

Ex.2: Compare

$$4\sqrt{5} \quad \text{and} \quad 3\sqrt{10}$$

$$\begin{aligned} &= \sqrt{16} \sqrt{5} & &= \sqrt{9} \sqrt{10} \\ &= \sqrt{80} & &= \sqrt{90} \\ & & & \therefore \sqrt{80} < \sqrt{90} \\ & & & \therefore 4\sqrt{5} < 3\sqrt{10} \end{aligned}$$

Ex.3: Simplify

$$\text{a) } \sqrt{6} \times \sqrt{3}$$

$$\begin{aligned} &= \sqrt{6 \times 3} \\ &= \sqrt{18} \\ &= \sqrt{9} \sqrt{2} \\ &= 3\sqrt{2} \end{aligned}$$

$$\text{b) } (-2\sqrt{7})(3\sqrt{7})$$

$$\begin{aligned} &= -6\sqrt{49} \\ &= -6(7) \\ &= -42 \end{aligned}$$

Note: Many rules are similar to algebra:

Ex.4: Simplify

radicals

algebra

$$\begin{aligned} \text{a) } & \sqrt{2} + \sqrt{2} + \sqrt{2} \\ & = 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} & x + x + x \\ & = 3x \end{aligned}$$

$$\begin{aligned} \text{b) } & 2\sqrt{3} + 5\sqrt{3} \\ & = 7\sqrt{3} \end{aligned}$$

$$\begin{aligned} & 2x + 5x \\ & = 7x \end{aligned}$$

$$\text{c) } 2\sqrt{3} + 3\sqrt{7}$$

$$2x + 3y$$

Summarizing some rules

$$\begin{aligned} & \sqrt{a} + \sqrt{a} \\ & = 2\sqrt{a} \end{aligned}$$

$$\begin{aligned} & \sqrt{a} \times \sqrt{a} \\ & = a \end{aligned}$$

$$\begin{aligned} & \sqrt{\frac{a}{b}} \\ & = \frac{\sqrt{a}}{\sqrt{b}} \end{aligned}$$

$$\begin{aligned} & \sqrt{a} \times \sqrt{b} \\ & = \sqrt{ab} \end{aligned}$$

Ex.5: Simplify

$$\begin{aligned} \text{a) } & 3(4 - \sqrt{6}) \\ & = 12 - 3\sqrt{6} \end{aligned}$$

$$\begin{aligned} \text{b) } & (2 - 3\sqrt{5})(6 + \sqrt{5}) \\ & = 12 + 2\sqrt{5} - 18\sqrt{5} - 3(5) \\ & = 12 - 16\sqrt{5} - 15 \\ & = -3 - 16\sqrt{5} \end{aligned}$$

$$\begin{aligned} \text{c) } & \sqrt{\frac{2}{9}} \\ & = \frac{\sqrt{2}}{\sqrt{9}} \\ & = \frac{\sqrt{2}}{3} \end{aligned}$$

$$\text{d) } \sqrt{50} + \sqrt{27} - \sqrt{72} + 2\sqrt{12}$$

$$\begin{aligned} & = \sqrt{25}\sqrt{2} + \sqrt{9}\sqrt{3} - \sqrt{36}\sqrt{2} + 2\sqrt{4}\sqrt{3} \\ & = 5\sqrt{2} + 3\sqrt{3} - 6\sqrt{2} + 2(2)\sqrt{3} \\ & = \underline{5\sqrt{2}} + \underline{3\sqrt{3}} - \underline{6\sqrt{2}} + \underline{4\sqrt{3}} \\ & = -\sqrt{2} + 7\sqrt{3} \end{aligned}$$

Note: The textbook gives answers with the denominator rationalized. This means that there is not a radical sign in the denominator. In order to accomplish this, just multiply by an equivalent of 1.

Ex.6: Simplify

You Try: Simplify

a) $\frac{\sqrt{7}}{\sqrt{3}}$
 $= \frac{\sqrt{7}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= \frac{\sqrt{21}}{3}$

b) $\frac{2\sqrt{3}}{\sqrt{20}}$
 $= \frac{2\sqrt{3}}{\sqrt{4 \cdot 5}}$
 $= \frac{2\sqrt{3}}{2\sqrt{5}}$
 $= \frac{\sqrt{3}}{\sqrt{5}}$
 $= \frac{\sqrt{3}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$
 $= \frac{\sqrt{15}}{5}$

c) $\frac{3\sqrt{2}}{2\sqrt{27}}$
 $= \frac{3\sqrt{2}}{2\sqrt{9 \cdot 3}}$
 $= \frac{3\sqrt{2}}{2(3)\sqrt{3}}$
 $= \frac{\sqrt{2}}{2\sqrt{3}}$
 $= \frac{\sqrt{2}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= \frac{\sqrt{6}}{2(3)}$
 $= \frac{\sqrt{6}}{6}$

d)

d1) $\frac{\sqrt{6}}{2\sqrt{18}}$
 $= \frac{\sqrt{6}}{2\sqrt{9 \cdot 2}}$
 $= \frac{\sqrt{6}}{2(3)\sqrt{2}}$
 $= \frac{\sqrt{6}}{6\sqrt{2}}$
 $= \frac{\sqrt{6}}{6\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$
 $= \frac{\sqrt{12}}{6(2)}$
 $= \frac{\sqrt{4 \cdot 3}}{12}$
 $= \frac{2\sqrt{3}}{12}$
 $= \frac{\sqrt{3}}{6}$

$\rightarrow = \frac{\sqrt{6} \sqrt{3}}{6\sqrt{2}}$
 $= \frac{\sqrt{18}}{6}$
 $= \frac{\sqrt{9 \cdot 2}}{6}$
 $= \frac{3\sqrt{2}}{6}$
 $= \frac{\sqrt{2}}{2}$

d2) $\frac{\sqrt{6}}{2\sqrt{18}} \sqrt{3} \rightarrow \frac{\sqrt{6}\sqrt{3}}{2\sqrt{9 \cdot 2}}$
 $= \frac{1}{2\sqrt{3}}$
 $= \frac{1}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= \frac{\sqrt{3}}{2(3)}$
 $= \frac{\sqrt{3}}{6}$

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 160-162 #1 – 5, 7, 9, 13 [17]

Today's Homework Practice includes:

pp. 167-168 #(1 – 7)ace, 8–10, 12 [15–17]