

Warm-up: Simplify each radical.

$$1. \sqrt{14} = \sqrt{2 \cdot 7}$$

$\begin{matrix} \uparrow & \uparrow \\ 2 & 7 \end{matrix}$
 $\sqrt{14}$

$$2. \sqrt{350} = \sqrt{2 \cdot 5 \cdot 5 \cdot 7}$$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow \\ 2 & 5 & 5 & 7 \end{matrix}$

$$5\sqrt{2 \cdot 7}$$
 $5\sqrt{14}$

$$3. -5\sqrt{260} = -5\sqrt{2 \cdot 2 \cdot 5 \cdot 13}$$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow \\ 2 & 2 & 5 & 13 \end{matrix}$
 $-5 \cdot 2 \cdot \sqrt{5 \cdot 13}$
 $-10\sqrt{65}$

$$4. \sqrt{600x^5} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot x \cdot x \cdot x}$$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\ 2 & 2 & 2 & 3 & 5 & 5 & x \end{matrix}$

$$2 \cdot 5 \cdot x \cdot x \cdot \sqrt{2 \cdot 3 \cdot x}$$
 $10x^2\sqrt{6x}$

$$5. 6\sqrt{770} = 6\sqrt{2 \cdot 5 \cdot 7 \cdot 11}$$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow \\ 2 & 5 & 7 & 11 \end{matrix}$
 $6\sqrt{770}$

$$6. \sqrt{480x^2} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot x \cdot x}$$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\ 2 & 2 & 2 & 2 & 3 & 5 & x \end{matrix}$
 $2 \cdot 2 \cdot x \cdot \sqrt{2 \cdot 3 \cdot 5}$
 $4x\sqrt{30}$

Add & Subtract Radicals:

1. Make sure each radical is simplified
 2. Combine like terms (radicals that are the same)
- * The radicals don't change!

$$2x + 4x = 6x$$

$$2\sqrt{3} + 4\sqrt{3} = 6\sqrt{3}$$

Example 1:

1. $3\sqrt{5} + 8 + 7\sqrt{5} = 10\sqrt{5} + 8$

2. $8\sqrt{3} - 8\sqrt{3} = 0$
 $4\sqrt{12} - 8\sqrt{3} = 0$
 Prime factorization of 12: $2 \cdot 2 \cdot 3$
 $4\sqrt{2 \cdot 2 \cdot 3} = 4 \cdot 2\sqrt{3} = 8\sqrt{3}$

$5\sqrt{3} + 6\sqrt{3} = 11\sqrt{3}$

3. $\sqrt{75} + \sqrt{108} =$
 Prime factorization of 75: $3 \cdot 5 \cdot 5$
 Prime factorization of 108: $2 \cdot 2 \cdot 3 \cdot 3 \cdot 3$

$\sqrt{75} = \sqrt{3 \cdot 5 \cdot 5} = 5\sqrt{3}$
 $\sqrt{108} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = 6\sqrt{3}$

5. $2\sqrt{3} + 7\sqrt{3} - 5\sqrt{7} = 9\sqrt{3} - 5\sqrt{7}$

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

4. $\sqrt{8} - \sqrt{27} =$
 Prime factorization of 8: $2 \cdot 2 \cdot 2$
 Prime factorization of 27: $3 \cdot 3 \cdot 3$
 $\sqrt{8} = \sqrt{2 \cdot 2 \cdot 2} = 2\sqrt{2}$
 $\sqrt{27} = \sqrt{3 \cdot 3 \cdot 3} = 3\sqrt{3}$

6. $4\sqrt{7} + 7\sqrt{3} = 4\sqrt{7} + 7\sqrt{3}$
 $4\sqrt{7} + \sqrt{147} =$
 Prime factorization of 147: $3 \cdot 7 \cdot 7$
 $\sqrt{147} = \sqrt{3 \cdot 7 \cdot 7} = 7\sqrt{3}$

Multiply Radicals:

1. Multiply the outsides
2. Multiply the insides
3. Simplify

Example 2:

1. $3\sqrt{5} \cdot 7\sqrt{5} = 21\sqrt{25}$

$$\frac{21 \cdot 5}{105}$$

2. $5\sqrt{7} \cdot 4\sqrt{3} = 20\sqrt{21}$

$$\begin{array}{c} \swarrow \searrow \\ 3 \quad 7 \end{array}$$

$$\sqrt{21} = \sqrt{3 \cdot 7}$$

3. $(\sqrt{17})^2 = \sqrt{17} \cdot \sqrt{17}$

$$\frac{\sqrt{289}}{17}$$

4. $(7\sqrt{3})^3 = 7\sqrt{3} \cdot 7\sqrt{3} \cdot 7\sqrt{3}$

$$\frac{343 \sqrt{27}}{1029 \sqrt{3}}$$

$$\begin{array}{c} 3^3 \cdot 3^3 \cdot 3^3 \\ \uparrow \quad \uparrow \quad \uparrow \\ 3 \quad 3 \quad 3 \end{array}$$

5. $-5\sqrt{6} \cdot 3\sqrt{8} = -15\sqrt{48}$

$$\frac{-15 \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}}{-60 \sqrt{3}}$$

$$\begin{array}{c} 2^4 \cdot 2^4 \cdot 3 \\ \uparrow \quad \uparrow \quad \uparrow \\ 2 \quad 2 \quad 2 \quad 2 \quad 3 \end{array}$$

6. $-7\sqrt{12} \cdot 9\sqrt{15} = -63\sqrt{180}$

$$\frac{-63 \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}}{-378 \sqrt{5}}$$

$$\begin{array}{c} 2^2 \cdot 3^2 \cdot 3^2 \cdot 5 \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 2 \quad 3 \quad 3 \quad 5 \end{array}$$

