

Example 1: Estimate Value of Radicals

$\sqrt{1} = 1$	$\sqrt{36} = 6$	$\sqrt{121} = 11$
$\sqrt{4} = 2$	$\sqrt{49} = 7$	$\sqrt{144} = 12$
$\sqrt{9} = 3$	$\sqrt{64} = 8$	$\sqrt{169} = 13$
$\sqrt{16} = 4$	$\sqrt{81} = 9$	$\sqrt{196} = 14$
$\sqrt{25} = 5$	$\sqrt{100} = 10$	$\sqrt{225} = 15$

Using the above information estimate the value of each radical. Do not use a calculator.

1. $\sqrt{34} =$

2. $\sqrt{200} =$
 ≈ 14.2

3. $\sqrt{119} =$

4. $8\sqrt{7} =$

Example 2: Simplifying Radicals

Simplify each radical. Show your work.

1. $\sqrt{128} =$
 $\sqrt{64 \cdot 2} = 8\sqrt{2}$

2. $\sqrt{200} =$
 $\sqrt{100 \cdot 2} = 10\sqrt{2}$
Short-cut: $\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5} = 2 \cdot 2 \cdot 2 \cdot 5 \sqrt{2} = 100 \cdot 2 = 200$

3. $\sqrt{850} =$

4. $\sqrt[3]{8} =$

5. $\sqrt[4]{320} =$
This is called a fourth root.
 $\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} = 2 \sqrt[4]{10}$
takes 4 factors, not 2.

6. $\sqrt[5]{32} =$
takes 5 factors Fifth root
 $\sqrt[5]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = 2$

Example 3: Add & Subtract Radicals:

(It's really collecting like terms.)

Add or subtract. Make sure all radicals are simplified.

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

$$2. \quad 4\sqrt{12} - 8\sqrt{3} =$$

$$\begin{array}{l} \begin{array}{c} \nearrow 6 \\ 2 \quad 2 \\ 2 \quad 3 \end{array} \quad \downarrow \\ 4 \cdot \sqrt{2 \cdot 2 \cdot 3} \\ 4 \cdot 2 \sqrt{3} \\ 8\sqrt{3} - 8\sqrt{3} \\ 0 \end{array}$$

$$3. \quad \sqrt{75} + \sqrt{108} =$$

$$\begin{array}{c} \begin{array}{c} \nearrow 15 \\ 5 \quad 3 \end{array} \quad \begin{array}{c} \nearrow 36 \\ 3 \quad 12 \end{array} \\ \downarrow \quad \downarrow \\ 5\sqrt{3} \quad 6\sqrt{3} \end{array}$$

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

$$4. \quad \sqrt{8} - \sqrt{27} =$$

$$\begin{array}{c} \begin{array}{c} \nearrow 2 \\ 2 \quad 2 \end{array} \quad \begin{array}{c} \nearrow 9 \\ 3 \quad 3 \end{array} \\ \downarrow \quad \downarrow \\ 2\sqrt{2} - 3\sqrt{3} \\ \text{Doesn't combine} \end{array}$$

Example 4: Multiply Radicals:

Multiply. Make sure all radicals are simplified.

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

$$\begin{array}{c} \text{3} \cdot \text{7} \cdot \sqrt{\text{5} \cdot \text{5}} \\ 21 \sqrt{25} \\ 21 \cdot 5 = 105 \end{array}$$

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

$$\begin{array}{c} 5 \cdot 4 \sqrt{7 \cdot 3} \\ \textcircled{20\sqrt{21}} \quad \begin{array}{c} 21 \\ \diagup \diagdown \\ 3 \quad 7 \end{array} \end{array}$$

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

$$\begin{array}{c} \sqrt{17 \cdot 17} \\ \textcircled{= 17} \end{array}$$

$$4. \quad (7\sqrt{3})^2 = 7\sqrt{3} \cdot 7\sqrt{3}$$

$$\begin{array}{c} 7 \cdot 7 \sqrt{3 \cdot 3} \\ 49 \cdot 3 \\ \textcircled{147} \end{array}$$