

# Simplify Higher Order Radicals

$$\begin{aligned} \textcircled{1} \quad & \sqrt{112} \\ & = 2 \cdot 2 \sqrt{7} \\ & = \boxed{4\sqrt{7}} \end{aligned}$$

$$\begin{array}{c} 112 \\ \swarrow \quad \searrow \\ 28 \quad 4 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 4 \quad 7 \quad 2 \quad 2 \\ \swarrow \quad \searrow \\ 2 \quad 2 \end{array}$$

$$\begin{aligned} \textcircled{2} \quad & 4\sqrt{192} \\ & = 4 \cdot 2 \cdot 2 \sqrt{3} \\ & = \boxed{32\sqrt{3}} \end{aligned}$$

$$\begin{array}{c} 192 \\ \swarrow \quad \searrow \\ 48 \quad 4 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 6 \quad 8 \quad 2 \quad 2 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ \textcircled{3} \quad 2 \quad 2 \quad 2 \quad 2 \end{array}$$

$$\begin{aligned} \textcircled{3} \quad & 7\sqrt[3]{16} \\ & = 7 \cdot 2 \sqrt[3]{2} \\ & = \boxed{14\sqrt[3]{2}} \end{aligned}$$

$$\begin{array}{c} 16 \\ \swarrow \quad \searrow \\ 4 \quad 4 \\ \swarrow \quad \searrow \\ \textcircled{2} \quad 2 \quad 2 \quad 2 \end{array}$$

$$\begin{aligned} \textcircled{4} \quad & 7\sqrt[4]{162} \\ & = 7 \cdot 3 \sqrt[4]{2} \\ & = \boxed{21\sqrt[4]{2}} \end{aligned}$$

$$\begin{array}{c} 162 \\ \swarrow \quad \searrow \\ 9 \quad 18 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 3 \quad 3 \quad 9 \quad 2 \\ \swarrow \quad \searrow \\ 3 \quad 3 \end{array}$$

$$\begin{aligned} \textcircled{5} \quad & -8\sqrt[7]{384} \\ & = -8 \cdot 1 \cdot 2 \sqrt[7]{3} \\ & = \boxed{-16\sqrt[7]{3}} \end{aligned}$$

$$\begin{array}{c} 384 \\ \swarrow \quad \searrow \\ 16 \quad 24 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 4 \quad 4 \quad 6 \quad 4 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 2 \quad 2 \quad 2 \quad 2 \quad \textcircled{3} \quad 2 \quad 2 \end{array}$$