

Steps to Simplify Radicals

- ① Use factor tree to find prime factorization
- ② Modify all variables to be divisible by index

* Index: $\sqrt[\#]{\quad}$

- ③ Use index to determine how to group the factors.
- ④ Multiply outside factors and inside factors.

$$\frac{\sqrt{98}}{7\sqrt{2}}$$

$$\begin{array}{r} 98 \\ \cancel{49} : 14 \\ : 2 \end{array}$$

$$\frac{\sqrt{45xy^2z^4}}{3yz^2\sqrt{5x}}$$

$$\begin{array}{r} 45 \\ \textcircled{5} : 9 \\ : 3 \end{array} \quad \textcircled{x} \cancel{y} \cancel{z}$$

$$4\sqrt{90x^2y^3}$$

$$\begin{array}{r} 90 \\ 9 : 10 \\ \cancel{30} : \textcircled{5 \cdot 2} \end{array} \quad \cancel{x} \cancel{y} \cancel{y}$$

$$4 \cdot 3xy\sqrt{10y}$$

$$\boxed{12xy\sqrt{10y}}$$

2.2 Simplifying Radicals of Higher Order

Ex 1) Simplify.

$$\sqrt[3]{54}$$

$$\boxed{3\sqrt[3]{2}}$$

$$\begin{array}{r} 54 \\ 9 \ 6 \\ \cancel{33} \ \cancel{32} \end{array}$$

$$3\sqrt[4]{48}$$

$$\sqrt[5]{x^{25}y^{17}z^3}$$

$$\boxed{x^5y^3\sqrt[5]{y^2z^3}}$$

$$\begin{array}{r} x^{25} \ y^{15} \ y^2 \ z^3 \\ \cancel{x^{15}} \ \cancel{y^{15}} \ y^2 \ z^3 \end{array}$$

$$2\sqrt[3]{40x^4y^8}$$

$$\begin{array}{r} 2 \cdot 2xy^2 \sqrt[3]{5xy^2} \\ \boxed{4xy^2\sqrt[3]{5xy^2}} \end{array}$$

$$\begin{array}{r} \cancel{x^3} \ \cancel{y^6} \ y^2 \\ 40 \\ 4 \ 10 \\ \cancel{22} \ \cancel{52} \end{array}$$

$$\sqrt[4]{64a^2}$$

$$\sqrt[3]{-32x^4y^4}$$

$$\begin{array}{r} -1 \cdot 2xy \sqrt[3]{4xy} \\ \boxed{-2xy\sqrt[3]{4xy}} \end{array}$$

$$\cancel{x^3} \ \cancel{y^3} \ y$$

$$\begin{array}{r} 32 \\ 16 \ 2 \\ 4 \ 4 \\ \cancel{22} \ \cancel{22} \end{array}$$

$$\sqrt[4]{243x^5y^6}$$