

Example 1 Convert From a Power to a Radical

$n \rightarrow$ base exponent
 $d \rightarrow$ root identity

Express each power as an equivalent radical.

- a) $64^{\frac{1}{2}}$ a) $64^{\frac{1}{2}}$ b) $16^{\frac{3}{4}}$ c) $(8x^2)^{\frac{1}{3}}$
- $\frac{1}{2} \rightarrow$ as a root
- $\sqrt{64}$
- $\sqrt[4]{16^3}$
- $\sqrt[3]{8x^2}$
- $= \sqrt[3]{64}$
- or $(\sqrt[4]{16})^3$
- $\sqrt[3]{8x^2}$
- $\sqrt{64}$

Example 2 Convert From a Radical to a Power

Express each radical as a power with a rational exponent. $\frac{n-b}{d} = r$

- a) $\sqrt[3]{4^9}$ b) $\sqrt{3^4}$ c) $\sqrt[5]{s^3}$
- $\frac{3}{4}$ $\frac{4}{2}$ $\frac{3}{5}$
- 4 3 5

Example 3 Convert Mixed Radicals to Entire Radicals

Express each **mixed radical** as an equivalent **entire radical**.

- a) $5\sqrt[3]{11}$ a) $5^2\sqrt{11}$ b) $2\sqrt[3]{5}$ c) $1.5\sqrt[3]{36}$
- $\sqrt[3]{5^2 \cdot 11}$ $\sqrt{25 \cdot 11}$ $\sqrt[3]{8 \cdot 5}$ $\sqrt[3]{3.375 \cdot 36}$
- $1.5\sqrt[3]{6}$ $\sqrt{275}$ $\sqrt[3]{40}$ $\sqrt[3]{20.25}$
- $\sqrt[3]{\frac{81}{4}}$

Example 4 Convert Entire Radicals to Mixed Radicals

Express each entire radical as an equivalent mixed radical.

- a) $\sqrt{27}$ b) $\sqrt{50}$ c) $\sqrt{48}$ d) $\sqrt[3]{80}$
- $\sqrt{9 \cdot 3}$ $\sqrt{25 \cdot 2}$ $\sqrt{4 \cdot 12}$ $\sqrt[3]{16 \cdot 5}$
- $3\sqrt{3}$ $5\sqrt{2}$ $2\sqrt{12}$ $2\sqrt[3]{5}$
- $2\sqrt{4 \cdot 3}$ $2 \cdot 2\sqrt{3}$
- $4\sqrt{3}$

Example 5 Order Irrational Numbers

Order these irrational numbers from least to greatest.

- $2\sqrt[3]{18}$ $\sqrt[3]{8}$ $3\sqrt[3]{2}$ $\sqrt[3]{32}$ $2\sqrt{8}$ $\sqrt{8}$ $3\sqrt{2}$ $\sqrt{32}$
- $2^2\sqrt{18}$ $3^2\sqrt{2}$ 8.485 2.828 4.243 5.657
- $\sqrt[3]{4 \cdot 18}$ $\sqrt[3]{9 \cdot 2}$ $\sqrt{2}$ $\sqrt{18}$
- $\sqrt{8}$ $3\sqrt{2}$ $\sqrt{32}$ $2\sqrt{18}$

Example 6 Solve Problems Involving Irrational Numbers

The Seabee Mine is located at Laonil Lake, SK. In 2007, the mine produced a daily average of gold great enough to fill a cube with a volume of 180 cm^3 . If five days of gold production is cast into a cube, what is its edge length?

$$180 \times 5 = 900 \text{ cm}^3$$

$$= \sqrt[3]{900}$$

$$= 9.7 \text{ cm}$$

The edge length is about 9.7 cm.

