

What about when there are variables involved?

Simplify. Assume all variables represent positive numbers.

a. $\sqrt{x^{10}} = \sqrt{\cancel{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}}$
 $\begin{matrix} \text{xxxxxx} \\ x^5 \end{matrix}$

b. $\sqrt{y^8} = \sqrt{\cancel{y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y}}$
 $\begin{matrix} \text{yyyyy} \\ y^4 \end{matrix}$

c. $\sqrt{36z^6} = \sqrt{\cancel{6 \cdot 6 \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z}}$
 $\pm 6z^3$

d. $\sqrt{81a^{12}} = \pm 9a^6$
 $\sqrt{4a^5} \rightarrow \sqrt{2 \cdot 2 \cdot a \cdot a \cdot a \cdot a}$
 $\pm 2a^2\sqrt{a}$

$$a^2 \cdot a^3 = a^{2+3} = a^5$$

$$(a^3)^2 = a^{3 \cdot 2} = a^6$$

$$\sqrt{16} = \pm 4$$

$$\pm 4^2 = 16$$

3) Find the following cube roots.

a. $\sqrt[3]{x^9}$
 $\sqrt[3]{\text{xxx xxx xxx}}$
 x^3

b. $\sqrt[3]{m^{17}}$
 $m^5 \sqrt{m^2}$
 Check $(m^5)^3 = m^{15}$
 $\sqrt{m^2 \cdot m^{15}} = \sqrt{m^{17}}$

2 | 64
 2 | 32
 2 | 16
 2 | 8
 2 | 4
 2 | 2

c. $\sqrt[3]{-64n^6}$
 $2 \cdot 2 n^2$
 $-4n^2$

d. $\sqrt[3]{8y^3}$
 $2y$

Finding the nth root.

a. $\sqrt[4]{81}$
 ± 3

81
 9 9
 3 3 3 3

b. $\sqrt[5]{-1024}$
 -4

c. $\sqrt[5]{32x^5y^{15}}$
 $2xy^3$

d. $\sqrt[3]{8x^6}$
 $3 \cdot 2 \cdot x^2$
 $6x^2$