Remember different forms

mixed to entire

$$2\sqrt[3]{5} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 5} = \sqrt[3]{40}$$

entire to mixed

$$\sqrt{\frac{32}{135}} \rightarrow \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{3 \cdot 3 \cdot 3 \cdot 5} = \frac{2 \cdot 2\sqrt{2}}{3\sqrt{3 \cdot 5}} = \frac{4\sqrt{2}}{3\sqrt{15}} \text{ OR } \frac{4}{3}\sqrt{\frac{2}{15}}$$

When is a <u>radical defined</u>?

1. $\sqrt{x}$ TEST $x = 1 \rightarrow \sqrt{1} = 1$ ✓
   $x = 0 \rightarrow \sqrt{0} = 0$ ✓
   $x = -1 \rightarrow \sqrt{-1}$ NOT a <u>Real</u> $x \geq 0$

2. $\sqrt{x^3}$ TEST $x = 1 \rightarrow \sqrt{1} = 1$ ✓
   $x = 0 \rightarrow \sqrt{0} = 0$ ✓
   $x = -1 \rightarrow \sqrt{-1}$ NOT a R. $x \geq 0$

3. $\sqrt{5x}$ $x = 1 \rightarrow \sqrt{5}$ ✓
   $x = 0 \rightarrow \sqrt{0}$ ✓
   $x = -1 \rightarrow \sqrt{-5}$ ✗ $x \geq 0$

4. $\sqrt[3]{x}$ $x = 1 \rightarrow \sqrt[3]{1}$ ✓ x is ALL <u>Real</u> numbers

4. $\sqrt[3]{x}$

$x=1 \to \sqrt[3]{1}$ ✓
$x=0 \to \sqrt[3]{0}$ ✓
$x=-1 \to \sqrt[3]{-1}$ ✓

x is ALL $\underline{Real}$ numbers

$x \in R$

5. $\sqrt[4]{-2x^3}$

$x=1 \to \sqrt[4]{-2}$ ✗
$x=0 \to \sqrt[4]{0}$ ✓
$x=-1 \to \sqrt[4]{2}$ ✓

$x \leq 0$

Simplify radicals with variables

1. $\sqrt{27x^3} = \sqrt{27}$ $\sqrt{x^3} \longrightarrow$ highest exponent that you can $\div 2$ evenly

$\downarrow$
$9 \cdot 3$ $\boxed{x \cdot x \cdot x} \longrightarrow$

$= 3\sqrt{3}$ $x\sqrt{x}$

$= 3x\sqrt{3x}$

$x^2 \, x$
$\downarrow \div 2$
$x\sqrt{x}$

2. $\sqrt{x^{43}} \leftarrow \sqrt{x^{42} \cdot x}$
$\Rightarrow \sqrt{x^{42} \cdot x}$
$\downarrow \div 2$
$x^{21}\sqrt{x}$

$\sqrt[3]{x^{43}} = x^{42} \cdot x$
$\div 3$
$x^{14}\sqrt[3]{x}$

$\sqrt[3]{x}$
$x^{\frac{1}{3}}$

3. $\sqrt[3]{16x^{16}} = \sqrt[3]{16}$ $\sqrt[3]{x^{16}} \leftarrow$

3. $\sqrt[3]{16x^{16}} = \sqrt[3]{16}$ $\sqrt[3]{x^{16}}$

$8 \cdot 2$

$= 2\sqrt[3]{2}$ $x^5\sqrt[3]{x}$

x^{15} x

$\div 3$

$= 2x^5\sqrt[3]{2x}$

4. $\sqrt{45a^7} = \sqrt{45}$ $\sqrt{a^7}$

9×5 $a^{[6]}a^1$

$=$

$3\sqrt{5}$ $= a^3\sqrt{a}$

$= 3a^3\sqrt{5a}$

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