

## Simplifying Radical Expressions

Simplify

$$\begin{aligned}\sqrt{98} &= \sqrt{49 \cdot 2} \\ &= 7\sqrt{2}\end{aligned}$$

$$\begin{aligned}\sqrt{48} &= \sqrt{16 \cdot 3} \\ &= 4\sqrt{3}\end{aligned}$$

Simplify

$$\sqrt{45} = \sqrt{9 \cdot 5}$$
$$3\sqrt{5}$$

$$\sqrt[3]{16} = \sqrt[3]{8 \cdot 2}$$
$$= 2\sqrt[3]{2}$$

$$\sqrt[3]{243}$$
$$\sqrt[3]{27 \cdot 9}$$
$$3\sqrt[3]{9}$$

$$\sqrt{288}$$
$$12\sqrt{2}$$

$$\sqrt[3]{81}$$
$$\sqrt[3]{27 \cdot 3}$$
$$3\sqrt[3]{3}$$

55-66

$$\sqrt[4]{64}$$
$$\sqrt[4]{16 \cdot 4}$$
$$2\sqrt[4]{4}$$

Simplify  $\sqrt{x^2} = (x^2)^{1/2} = x$

$$\begin{aligned}\sqrt{x^3} &= \sqrt{x^2} \cdot \sqrt{x} \\ &= x\sqrt{x}\end{aligned}$$

$$\begin{aligned}\sqrt{x^9} &= \sqrt{x^8} \cdot \sqrt{x} \\ &= x^4 \cdot \sqrt{x}\end{aligned}$$

$$\begin{aligned}\sqrt{x^{101}} &= \sqrt{x^{100}} \cdot \sqrt{x} \\ &= x^{50} \sqrt{x}\end{aligned}$$

Decrease  
power by 1 to make  
even.

Simplify

$$\sqrt[3]{x^4} = \sqrt[3]{x^3} \cdot \sqrt[3]{x}$$
$$x \sqrt[3]{x}$$

$$\sqrt[3]{x^{26}} = \sqrt[3]{x^{24}} \cdot \sqrt[3]{x^2}$$
$$x^8 \cdot \sqrt[3]{x^2}$$

Decrease by 1 or 2  
to make a multiple  
of 3

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

3  
6  
9  
12  
15  
18  
21  
24  
27  
30

$$\sqrt[3]{x^{11}} = \sqrt[3]{x^9} \cdot \sqrt[3]{x^2}$$
$$x^3 \sqrt[3]{x^2}$$

Simplify

$$\begin{aligned} & \sqrt[4]{x^7} \\ & \sqrt[4]{x^4} \cdot \sqrt[4]{x^3} \\ & x \sqrt[4]{x^3} \end{aligned}$$

$$\begin{aligned} & \sqrt[4]{y^6} \\ & \sqrt[4]{y^4} \cdot \sqrt[4]{y^2} \\ & y \sqrt[4]{y^2} \end{aligned}$$

67-70

Decrease by 1, 2, or 3 to  
get a multiple of 4

$$\begin{aligned} & \sqrt[4]{x^{27}} \\ & \sqrt[4]{x^{24}} \cdot \sqrt[4]{x^3} \\ & x^6 \cdot \sqrt[4]{x^3} \end{aligned}$$

- 4
- 8
- 12
- 16
- 20
- 24
- 28
- 32
- 36
- 40

Simplify

$$\begin{array}{ccc} \sqrt{72n^7} & \sqrt{72} & \sqrt{n^7} \\ \sqrt{36 \cdot 2} & & \sqrt{n^6 \cdot n} \\ 6\sqrt{2} & & n^3\sqrt{n} \\ \swarrow & & \searrow \\ 6n^3\sqrt{2n} & & \end{array}$$

$$\begin{array}{l} \sqrt{63u^3v^5} = \sqrt{63} \cdot \sqrt{u^3} \cdot \sqrt{v^5} \\ \sqrt{9 \cdot 7} \quad u\sqrt{u} \quad v^2\sqrt{v} \\ 3\sqrt{7} \\ 3uv^2\sqrt{7uv} \end{array}$$

Simplify

$$\sqrt[3]{54p^{10}}$$

$$\begin{aligned} &\sqrt[3]{27} \cdot \sqrt[3]{2} \cdot \sqrt[3]{p^9} \cdot \sqrt[3]{p} \\ &3\sqrt[3]{2} \cdot p^3\sqrt[3]{p} \\ &3p^3\sqrt[3]{2p} \end{aligned}$$

$$\sqrt[3]{40x^4y^5}$$

$$\begin{aligned} &\sqrt[3]{40} \\ &\sqrt[3]{8} \cdot \sqrt[3]{5} \cdot \sqrt[3]{x^3} \cdot \sqrt[3]{x} \cdot \sqrt[3]{y^3} \cdot \sqrt[3]{y^2} \\ &2xy\sqrt[3]{5xy^2} \end{aligned}$$



Simplify

$$\begin{aligned} & \sqrt[4]{64x^{10}} \\ & \sqrt[4]{16} \cdot \sqrt[4]{4} \cdot \sqrt[4]{x^8} \cdot \sqrt[4]{x^2} \\ & 2x^2 \sqrt[4]{4x^2} \end{aligned}$$

$$\begin{aligned} & \sqrt[4]{48x^4y^7} \\ & \sqrt[4]{16} \cdot \sqrt[4]{3} \cdot \sqrt[4]{x^4} \cdot \sqrt[4]{y^4} \cdot \sqrt[4]{y^3} \\ & 2xy \sqrt[4]{3y^3} \end{aligned}$$

Simplify  $(-3)(-3)(-3)$

$$\sqrt[3]{-27} = -3$$

$$\sqrt[4]{-16} \text{ No Real Solution} = 2i$$

$$3 + \sqrt{32}$$

$$3 + \sqrt{16} \cdot \sqrt{2}$$

$$3 + 4\sqrt{2}$$

$$\frac{4 - \sqrt{48}}{2}$$

$$\sqrt{48} = 4\sqrt{3}$$

$$\frac{4}{2} - \frac{\sqrt{48}}{2}$$

$$2 - \frac{4\sqrt{3}}{2}$$

$$2 - 2\sqrt{3}$$

Simplify

$$\frac{20 + \sqrt{75}}{5}$$

$$\frac{20}{5} + \frac{\sqrt{75}}{5}$$

$$\frac{20}{5} + \frac{5\sqrt{3}}{5}$$

$$4 + \sqrt{3}$$

$$\sqrt{75} = \frac{\sqrt{25} \cdot \sqrt{3}}{5\sqrt{3}}$$

$$71 - \frac{49}{85} \text{ odd}$$