

Simplifying Radicals with Variables:

$$\sqrt{20x^5} \quad x \times x \times x \times x$$

$$\begin{array}{c} \swarrow \quad \searrow \\ 5 \quad 4 \\ \swarrow \quad \searrow \\ 2 \quad 2 \end{array}$$

$$2x \times \sqrt{5x}$$

$$\boxed{2x^2\sqrt{5x}}$$

Example 2: Simplify each radical.

a) $\sqrt{80m^9}$ $m \times m \times m \times m \times m \times m \times m \times m \times m$

$$\begin{array}{c} \swarrow \quad \searrow \\ 16 \quad 5 \\ \swarrow \quad \searrow \\ 2 \quad 8 \\ \swarrow \quad \searrow \\ 2 \quad 4 \\ \swarrow \quad \searrow \\ 2 \quad 2 \end{array}$$

$$2 \cdot 2 \cdot m \cdot m \cdot m \cdot \sqrt{5m}$$

$$\boxed{4m^4\sqrt{5m}}$$

b) $\sqrt{50t^5}$ $t \times t \times t \times t \times t$

$$\begin{array}{c} \swarrow \quad \searrow \\ 5 \quad 10 \\ \swarrow \quad \searrow \\ 5 \quad 2 \end{array}$$

$$5t \cdot t \cdot \sqrt{2t}$$

$$\boxed{5t^2\sqrt{2t}}$$

c) $\sqrt{48n^8}$ $n \times n \times n \times n \times n \times n \times n \times n$

$$\begin{array}{c} \swarrow \quad \searrow \\ 8 \quad 6 \\ \swarrow \quad \searrow \\ 4 \quad 2 \quad 3 \quad 2 \\ \swarrow \quad \searrow \\ 2 \quad 2 \end{array}$$

$$2 \cdot 2 \cdot n \cdot n \cdot n \cdot n \cdot \sqrt{3}$$

$$\boxed{4n^4\sqrt{3}}$$

Whole Numbers and Radicals:

Multiply in*in and out*out

Example 3: Simplify each expression completely.

a) $2\sqrt{7t} \cdot 3\sqrt{14t^2} \cdot tt$

$6\sqrt{98ttt}$
 $\begin{array}{c} \wedge \\ 49 \quad 2 \\ \wedge \quad \wedge \\ 7 \quad 7 \end{array}$
 $6 \cdot 7t \sqrt{2t}$
 $42t\sqrt{2t}$

b) $3\sqrt{6} \cdot \sqrt{18}$

$3\sqrt{108}$
 $\begin{array}{c} \wedge \\ 6 \quad 18 \\ \wedge \quad \wedge \\ 3 \quad 2 \quad 6 \quad 3 \\ \wedge \quad \wedge \\ 3 \quad 2 \end{array}$
 $3 \cdot 3 \cdot 2 \sqrt{3}$
 $18\sqrt{3}$

c) $7\sqrt{5x} \cdot 3\sqrt{20x^5}$

$21\sqrt{100xxx}$
 $\begin{array}{c} \wedge \\ 50 \quad 2 \\ \wedge \quad \wedge \\ 25 \quad 2 \\ \wedge \quad \wedge \\ 5 \quad 5 \end{array}$
 $21 \cdot 5 \cdot 2 xxx$
 $210x^3$