

## LESSON #2 SIMPLIFYING RADICALS

The simplest form of a radical expression is an expression that has:

- no perfect square factors other than 1 in the radicand
- no fractions in the radicand
- no radicals in the denominator of a fraction

### Product Property of Radicals

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

EXAMPLES: Simplify the expression.

1.  $\sqrt{50}$

$$\begin{array}{r} 2 \overline{)50} \\ \underline{5} \phantom{0} \\ 25 \\ \underline{5} \\ 5 \end{array}$$

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

$$5\sqrt{2}$$

2.  $\sqrt{6} \cdot \sqrt{10}$

$$\begin{array}{r} 2 \overline{)60} \\ \underline{2} \phantom{0} \\ 30 \\ \underline{5} \\ 15 \\ \underline{3} \end{array}$$

$$\sqrt{6 \cdot 10}$$

$$\sqrt{2 \cdot 3 \cdot 2 \cdot 5}$$

$$2\sqrt{15}$$

# You try a few!

$$3. \sqrt{12} \quad \begin{array}{r} 2 \overline{)12} \\ 2 \overline{)6} \\ 3 \end{array}$$

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

$$\boxed{2\sqrt{3}}$$

$$5. \sqrt{135} \quad \begin{array}{r} 5 \overline{)135} \\ 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$$

$$\sqrt{3 \cdot 3 \cdot 3 \cdot 5}$$

$$\boxed{3\sqrt{15}}$$

$$4. \sqrt{15} \cdot \sqrt{6}$$

$$\sqrt{5 \cdot 3 \cdot 3 \cdot 2}$$

$$\boxed{3\sqrt{10}}$$

$$6. \sqrt{10} \cdot \sqrt{18} \quad \begin{array}{r} 2 \overline{)45} \\ 2 \overline{)3 \cdot 3 \cdot 5} \end{array}$$

$$\sqrt{5 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$$

$$\boxed{6\sqrt{5}}$$

$$7. \sqrt{8a^2b^3} \quad \begin{array}{r} 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$$

$$\sqrt{2 \cdot 2 \cdot 2 \cdot a \cdot a \cdot b \cdot b \cdot b}$$

$$\boxed{2ab\sqrt{2b}}$$

$$\begin{array}{r} 2 \overline{)18} \\ 9 \end{array}$$

$$9. -2\sqrt{18x^5}$$

$$-2\sqrt{2 \cdot 9 \cdot x \cdot x \cdot x \cdot x \cdot x}$$

$$\boxed{-6x^2\sqrt{2x}}$$

$$8. \sqrt{72cd^4} \quad \begin{array}{r} 2 \overline{)72} \\ 2 \overline{)36} \\ 2 \overline{)18} \\ 3 \overline{)9} \\ 3 \end{array}$$

$$\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot c \cdot d \cdot d \cdot d \cdot d}$$

$$\boxed{6d^2\sqrt{2c}}$$

$$10. \underline{3}\sqrt{2y} \cdot \underline{5}\sqrt{6y^3}$$

$$15\sqrt{2 \cdot 2 \cdot 3 \cdot y \cdot y \cdot y \cdot y}$$

$$\boxed{30y^2\sqrt{3}}$$

## Quotient Property of Radicals

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Simplify  
if possible!

EXAMPLES: Simplify the expression.

11.  $\sqrt{\frac{32}{50}}$

$\sqrt{\frac{16}{25}} = \frac{\sqrt{16}}{\sqrt{25}} = \frac{4}{5}$

12.

$$\frac{\sqrt{11}}{\sqrt{81}} = \frac{\sqrt{11}}{9}$$

You try a few!

13.  $\sqrt{\frac{4}{9}} = \frac{2}{3}$

14.  $\frac{\sqrt{7}}{\sqrt{16}} = \frac{\sqrt{7}}{4}$

15.  $\frac{\sqrt{18}}{\sqrt{32}} = \frac{\sqrt{9}}{\sqrt{16}} = \frac{3}{4}$

16.  $\sqrt{\frac{2}{25}} = \frac{\sqrt{2}}{\sqrt{25}} = \frac{\sqrt{2}}{5}$

Rationalizing the Denominator

17.  $\frac{\sqrt{1}}{\sqrt{18}}$

$$\frac{\sqrt{1}}{\sqrt{2 \cdot 3 \cdot 3}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{\sqrt{2}}{6}$$

18.  $\sqrt{\frac{2}{3}} \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$$\frac{\sqrt{6}}{3}$$

Rationalizing the Denominator

19.  $\sqrt{\frac{27 \div 3}{15 \div 3}}$

$$\frac{\sqrt{9}}{\sqrt{5}}$$

$$\frac{3 \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$$

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

20.  $\frac{4\sqrt{5}}{\sqrt{12}} \frac{4\sqrt{5}}{\sqrt{2 \cdot 2 \cdot 3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$$\frac{4\sqrt{15}}{6 \div 2}$$

$$\frac{2\sqrt{15}}{3}$$

## You try a few!

$$21. \sqrt{\frac{1}{5}}$$

$$\frac{\sqrt{1}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\boxed{\frac{\sqrt{5}}{5}}$$

$$22. \frac{2\sqrt{7}}{\sqrt{72}}$$

$$\frac{2\sqrt{7}}{\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{2\sqrt{14}}{12 \div 2}$$

$$\boxed{\frac{\sqrt{14}}{6}}$$

## You try a few!

$$23. \frac{\sqrt{28} \div 4}{\sqrt{20} \div 4}$$

$$\frac{\sqrt{7}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\boxed{\frac{\sqrt{35}}{5}}$$

$$24. \frac{3\sqrt{6}}{\sqrt{36}} = \frac{3\sqrt{6}}{6 \div 3}$$

$$\boxed{\frac{\sqrt{6}}{2}}$$