## Algebra II

## Lesson 7.2: Multiplying and Dividing Radical Expressions

Mrs. Snow, Instructor
There are two basic square root properties:

1. Product Property of Square Roots: the square root of a number is equal to the product of the square roots of the factors
example: $\sqrt{\mathbf{2 0}}=$
$\longrightarrow \sqrt{a b}=\sqrt{a \cdot b}=\sqrt{a} \cdot \sqrt{b}$

$$
\sqrt{5} \cdot \sqrt{20}=
$$

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

2. Quotient Property of Square Roots: the square root of a quotient is equal to the quotient of the square roots of the dividend and the divisor.

$$
\begin{array}{ccc}
\text { example: } \sqrt{\frac{9}{16}}= & \longrightarrow & \sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}} \\
\frac{\sqrt{8}}{\sqrt{2}}= & \longrightarrow & \frac{\sqrt{a}}{\sqrt{b}}=\sqrt{\frac{a}{b}}
\end{array}
$$

These properties hold for all radicals. NOTE! You must have the same roots to be able to multiply or divide.

So here is where the "game of ping pong" comes in. From Lesson 7.1 we learned that for even exponents and even roots we apply an absolute value to the simplified variables. UNLESS OTHERWISE STATED, the variables are assumed to be positive and thus we do not need the absolute value symbols in our answers.
You must read directions! This is where you will be told to assume positive variables or to use the absolute value symbols as needed!
(Live on the edge! Read!)

Combine the two integers under the same radical sign, multiply or divide as indicated and simplify if possible. Assume positivevariables.

| $\sqrt{3} \times \sqrt{12}$ | $\sqrt[4]{8} \times \sqrt[4]{-4}$ | $\frac{\sqrt{9 x^{4}}}{\sqrt{3 x}}$ |
| :---: | :---: | :---: |
| $\frac{\sqrt{24 x}}{\sqrt{6 x}}$ | $\sqrt{2} \sqrt[3]{4}$ | $3 \sqrt{7 x^{3}} \cdot 2 \sqrt{21 x^{3} y^{2}}$ |
| $\sqrt{72 x^{3} y^{4}}$ | $\frac{\sqrt{6 x}}{\sqrt{3 x}}$ | $\sqrt[3]{\frac{108 x^{5} y^{14}}{4 x^{2} y^{6}}}$ |
|  |  |  |

## Rationalizing the denominator:

When we find a radical in the denominator, it needs to be removed. It is considered improper format and it will be easier to calculate the decimal approximation. The process that clears out radicals in the denominator is called rationalizing the denominator. To simply, multiply the fraction by another fraction in the form of " 1 ". Remember that the identity value " 1 " comes in many forms: $\frac{2}{2}, \frac{-6}{-6}, \frac{\sqrt{3}}{\sqrt{3}}$, and so on. The form of 1 which you need to use will be such that the denominator becomes a perfect square, cube, etc. of the radical denominator.
Example: Rationalize: $\frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}=\frac{\sqrt{3 \cdot 5}}{\sqrt{5 \cdot 5}}=\frac{\sqrt{15}}{5} \quad$ Now rationalize the denominator:


