Secondary 2
lesson 0.9

Multiplying, Dividing, and Rationalizing Radicals

Objective:

Multiply Radicals

Divide Radicals

Rationalize Radicals

Multiplying Radicals

Knowing the perfect squares greater than 1 (namely, 4, 9, 16, and so on) w
simplify some radical expressions.

Essential Understanding You can simplify a radical expression when the exponent of one factor of the radicand is a multiple of the radical's index.

Same Exponent	Same
$2^2 \cdot 3^2 = (2 \cdot 3)^2$	$\sqrt{2} \cdot \sqrt{3}$
$4^3 \cdot 5^3 = (4 \cdot 5)^3$	$\sqrt[3]{4} \cdot \sqrt[3]{5}$

You can simplify the product of powers that have the same exponent. Similarly, you can simplify the product of radicals that have the same index.

take note

Property **Combining Radical Expressions: Products**

**Only combine directly if the index is the same.*

Problem 1 Multiplying Radical Ex

Can you simplify? In other words – Can you multiply these radicals?

a. $\sqrt[4]{7} \cdot \sqrt[5]{}$

b. $\sqrt[5]{-5} \cdot \sqrt[5]{}$

Plan

What condition allow you to us the property for multiplying

Problem 3 Simplifying a l

What is the simplest form of $\sqrt{72x^3y^2}$ ·

Got It? What is the simplest form of $\sqrt{45x^5y^3} \cdot \sqrt{35xy^4}$?

Multiply Radical Binomials

Problem 4 Multiplying Binomial Radical

A $(4 + 2\sqrt{2})(5 + 4$

B $(3 - \sqrt{7})(5 +$

You can use the FOIL method to multiply binomials that have radical e
Remember that the FOIL method ensures that you multiply each term
binomial by each term of the other.

Multiply. **7.** $(\sqrt{3} + \sqrt{5}$

Don't just square each number ☺

What is the product $(5 - \sqrt{7})(5 + \sqrt{7})$?

These are called conjugates.
Learn and use the shortcut ☺

Dividing Radicals

Since you define division in terms of multiplication, you can extend the property for multiplying radical expressions. If the indexes are the same, you can write a quotient of roots as a root of a quotient.

Multiplying	
$\sqrt{2} \cdot \sqrt{3} = \sqrt{2 \cdot 3}$	
$\sqrt[3]{4} \cdot \sqrt[3]{5} = \sqrt[3]{4 \cdot 5}$	

take note

Property Combining Radical Expressions: Quotients

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$

When dividing radicals, you may want to combine them into one radical (fraction) and then simplify. Remember the index must be the same.

Problem 4 **Dividing Radical Exp**

What is the simplest form of the quo

There are three ways.

A $\frac{\sqrt{18x^5}}{\sqrt{\ }}$

The first method is to start by combining under one radical and dividing.

B) $\frac{\sqrt{25}}{\sqrt{4}}$

The second method is to just simplify each radical.

Rationalizing Radicals in Denominators

When we divide by radicals it is improper to have a radical in the denominator of the fraction. So we do something called "rationalizing the denominator" to get rid of the radical on the bottom.

Remember, we cannot change the fraction, so we can only multiply by the same expressions to the top and the bottom of the fraction (essentially multiplying by 1).

Steps:

1. Simplify each term.
2. Multiply the top and bottom by the expression that makes the denominator a rational number
3. Simplify the fraction.

Examples: Rationalize the denominator

19) $\frac{2}{\sqrt{3}}$

20) $\frac{4}{\sqrt{5}}$

21) $\frac{1}{4\sqrt{3}}$

22) $\frac{3}{2\sqrt{2}}$

Landing our Big Ideas:

- ❖Multiply verses Addition: Always start by recognizing what the main operation in the problem is.

- ❖Multiply Radicals:
  - Check the index – they must be the same
  - Combine under one radical (don't be too quick to multiply)
  - Simplify
  - Don't lose track of the index

- ❖Watch Out!: You can't have a radical in the denominator if a problem is simplified.

- Journal Entry: What is the process for multiplying radicals?

Assignment:

Packet 0.9

and

0.9 Math XL