Lesson 3 Multiplying Radicals

When multiplying radicals, the coefficients and radicals are multiplied separately. **Radicals should always be simplified.**

Examples
Multiply

1. $(3\sqrt{2})(4\sqrt{5})$

$12\sqrt{10}$

2. $(3\sqrt{10})(\sqrt{2}+2\sqrt{5})$

use distributive property
simplify all complex radicals

$3\sqrt{20} + 6\sqrt{50}$

$3(2)\sqrt{5} + 6(5)\sqrt{2}$

$6\sqrt{5} + 30\sqrt{2}$

A radical multiplied by itself comes out of the root sign

$\sqrt{5}\cdot\sqrt{5}$ $\sqrt{4}\sqrt{4}$

$\sqrt{25}$ $\sqrt{16}$

5 4

$\sqrt{11}\sqrt{11}$ $\sqrt{989}\sqrt{989}$

$\sqrt{121}$ 989

11

3. $(2\sqrt{5}+4\sqrt{2})(3\sqrt{2}-\sqrt{5})$

$6\sqrt{10} - 2(5) + 12(2) - 4\sqrt{10}$

$6\sqrt{10} - 10 + 24 - 4\sqrt{10}$

$2\sqrt{10} + 14$

4. $(\sqrt{5}-\sqrt{2})^2$ means $(\sqrt{5}-\sqrt{2})(\sqrt{5}-\sqrt{2})$

$-\sqrt{10}$ $-\sqrt{10}$

$5 - 2\sqrt{10} + 2$

$7 - 2\sqrt{10}$

shortcut for squaring a binomial

1.) Square the first term $(\sqrt{5})^2$

2.) Double the inner product $2(-\sqrt{10})$

3.) Square the last $(-\sqrt{2})^2$

Identify the values of the variables for which each expression is defined, then expand and simplify.

5. $(2\sqrt{a}+7)(5\sqrt{a}-3)$

$a \geq 0$

$10a - 6\sqrt{a} + 35\sqrt{a} - 21$

$10a + 29\sqrt{a} - 21$

6. $(3\sqrt{x}+\sqrt{y})(3\sqrt{x}-\sqrt{y})-(\sqrt{x}+5\sqrt{y})^2$

conjugates

$x, y \geq 0$

$9x - \cancel{3\sqrt{xy}} + \cancel{3\sqrt{xy}} - y \; -1(x + 10\sqrt{xy} + 25y)$

$9x - y - x - 10\sqrt{xy} - 25y$

$8x - 26y - 10\sqrt{xy}$

Examples
Multiply, using exponential form.

7. $\sqrt[4]{x^3} \cdot \sqrt{x}$ $x \geq 0$

$x^{\frac{3}{4}} \cdot x^{\frac{1}{2}}$

$x^{\frac{3}{4} + \frac{2}{4}}$

$x^{\frac{5}{4}}$

or $\sqrt[4]{x^5}$ $\sqrt[4]{x^4 \cdot x}$

$x\sqrt[4]{x}$

8. $\sqrt[5]{x^4} \cdot \sqrt[3]{x}$

$x^{\frac{4}{5}} \cdot x^{\frac{1}{3}}$

$x^{\frac{4}{5} + \frac{1}{3}}$

$x^{\frac{12}{15} + \frac{5}{15}}$

$x^{\frac{17}{15}}$

9. $\sqrt{x^7} \cdot \sqrt[3]{x^5}$

$x^{\frac{7}{2}} \cdot x^{\frac{5}{3}}$

$x^{\frac{7}{2} + \frac{5}{3}}$

$x^{\frac{21}{6} + \frac{10}{6}}$

$x^{\frac{31}{6}}$