

Reteaching 7-3

Binomial Radical Expressions

OBJECTIVE: Multiplying and dividing binomial radical expressions

MATERIALS: None

- Conjugates, such as $\sqrt{a} + \sqrt{b}$ and $\sqrt{a} - \sqrt{b}$, differ only in the sign of the second term. If a and b are rational numbers, then the product of conjugates produce a rational number:

$$(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = (\sqrt{a})^2 - (\sqrt{b})^2 = a - b.$$

- You can use the conjugate of a radical denominator to rationalize the denominator.

Examples

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

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

← These are conjugates.

$$= (2\sqrt{7})^2 - (\sqrt{5})^2$$

← Use the difference of squares formula.

$$= 28 - 5 = 23$$

← Simplify.

Rationalize the denominator of $\frac{4\sqrt{2}}{1 + \sqrt{3}}$.

$$\frac{4\sqrt{2}}{1 + \sqrt{3}}$$

$$= \frac{4\sqrt{2}}{1 + \sqrt{3}} \cdot \frac{1 - \sqrt{3}}{1 - \sqrt{3}}$$

← Use the conjugate of $1 + \sqrt{3}$ to rationalize the denominator.

$$= \frac{4\sqrt{2} - 4\sqrt{6}}{1 - 3}$$

← Multiply.

$$= \frac{4\sqrt{2} - 4\sqrt{6}}{-2} = -\frac{(4\sqrt{2} - 4\sqrt{6})}{2}$$

← Simplify.

$$= \frac{-4\sqrt{2} + 4\sqrt{6}}{2}$$

Exercises

Simplify. Rationalize all denominators.

1. $(3 + \sqrt{6})(3 - \sqrt{6})$

2. $\frac{2\sqrt{3} + 1}{5 - \sqrt{3}}$

3. $(4\sqrt{6} - 1)(\sqrt{6} + 4)$

4. $\frac{2 - \sqrt{7}}{2 + \sqrt{7}}$

5. $(2\sqrt{8} - 6)(\sqrt{8} - 4)$

6. $\frac{\sqrt{5}}{2 + \sqrt{3}}$