

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

Multiplication of Radical Expressions

◆ We can multiply radical expressions using the **Product Rule of Radicals** & other basic properties of multiplication.

EXAMPLE

Multiply and simplify the product.

(A) $(2a\sqrt{5})(8\sqrt{10})$

Recall

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$$

(B) $7\sqrt{2}(3 + \sqrt{2})$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

PRACTICE

Simplify the following.

(A) $(2\sqrt{5})(4\sqrt{7})$

(B) $(4\sqrt{x})(3\sqrt{xy})$

Recall

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$$

PRACTICE

Simplify the following.

(A) $\sqrt{3}(2 - \sqrt{6})$

(B) $\sqrt{5x}(4 + \sqrt{x})$

EXAMPLE

Simplify the following.

$$(4 - 6\sqrt{2y})(3 + \sqrt{2y})$$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

PRACTICE

Simplify the following.

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

Recall

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{a \cdot b}$$

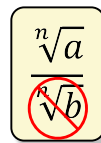
EXAMPLE

Simplify the following.

$$(\sqrt[3]{4a} + 2)(\sqrt[3]{4a} + 5)$$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

Rationalizing Denominators



◆ Radicals CANNOT be left in the BOTTOM of a fraction. This is **BAD!**

► If you can't simplify the $\sqrt{}$ to perf. square, you must *make* it a perf. square by **Rationalizing the Denominator:**

► Multiply & by *something* (usually bottom $\sqrt{}$)

Radical simplifies to perfect square

$$\frac{\sqrt{2}}{\sqrt{8}} = \sqrt{\frac{2}{8}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

Rationalizing Denominator

EXAMPLE: Rationalize the denominator.

$$\frac{1}{\sqrt{3}} \cdot (-)$$

Caution!

Multiplying *only* the **bottom** is wrong!

PRACTICE

Rationalize the denominator.

(A) $-\frac{5}{2\sqrt{7}}$

(B) $\frac{6+\sqrt{x}}{-\sqrt{x}}$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

EXAMPLE

Write the following quotients in the lowest terms.

(A)
$$\frac{\sqrt{18} + 6}{3}$$

(B)
$$\frac{2\sqrt[3]{16} - 4}{4}$$

EXAMPLE

Write the following quotients in the lowest terms.

(A)
$$\frac{\sqrt{81}}{\sqrt{9}}$$

(B)
$$\frac{\sqrt{49x^2}}{\sqrt{x^2}}$$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

Rationalize Denominators Using Conjugates

◆ When the **denominator** has ____ terms, multiplying by same $\sqrt{\quad}$ won't eliminate the $\sqrt{\quad}$

► Instead, multiply by the **bottom's conjugate** (reverse _____ between terms)

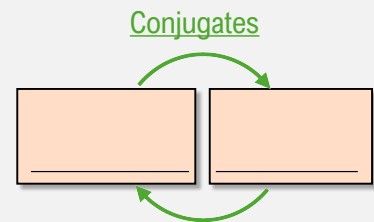
One Term **Denominator**

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

Two Term **Denominator**

EXAMPLE: Rationalize the denominator.

$$\frac{1}{2 + \sqrt{3}} \cdot \frac{(\quad)}{(\quad)}$$



◆ Multiplying a radical by its **conjugate** ALWAYS _____ the $\sqrt{\quad}$ and results in rational numbers.

PRACTICE

Rationalize the denominator and simplify the radical expression.

(A)

$$\frac{\sqrt{7}}{5 - \sqrt{6}}$$

(B)

$$\frac{2 - \sqrt{3}}{2 + \sqrt{3}}$$

SPECIAL PRODUCT FORMULAS

$$(a + b)(a - b) = a^2 - b^2$$

TOPIC: MULTIPLYING, DIVIDING, AND RATIONALIZING RADICAL EXPRESSIONS

EXAMPLE

Rationalize the denominators of the following.

(A)

$$\frac{x + 2}{\sqrt{x} + 1}$$

(B)

$$\frac{1}{\sqrt{x} + \sqrt{y}}$$