

# CHAPTER 11: RADICAL EXPRESSIONS

## 11.2 Operations with Radical Expressions



# OBJECTIVES

- I can add, subtract, multiply and divide radical expressions



# PART 1: SIMPLIFYING RADICAL EXPRESSIONS

For radical expressions, **like radicals** have the same radicand. **Unlike radicals** do not have the same radicand. For example,  $4\sqrt{7}$  and  $-12\sqrt{7}$  are like radicals, but  $3\sqrt{11}$  and  $2\sqrt{5}$  are unlike radicals. To simplify sums and differences, you use the Distributive Property to combine like radicals.



# PART 1: ADDING & SUBTRACTING

**1** Simplify each expression.

a.  $-3\sqrt{5} - 4\sqrt{5}$

b.  $\sqrt{10} - 5\sqrt{10}$



# PART 1: ADDING & SUBTRACTING

**2** Simplify each expression.

a.  $3\sqrt{20} + 2\sqrt{5}$

b.  $3\sqrt{3} - 2\sqrt{27}$



# PART 2: MULTIPLYING

**3** Simplify each radical expression.

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

**b.**  $\sqrt{2x}(\sqrt{6x} - 11)$



# PART 2: MULTIPLYING

**4** Simplify each radical expression.

**a.**  $(2\sqrt{6} + 3\sqrt{3})(\sqrt{6} - 5\sqrt{3})$

**b.**  $(\sqrt{7} + 4)^2$



# PART 3: DIVISION

**Conjugates** are the sum and the difference of the same two terms. The radical expressions  $\sqrt{5} + \sqrt{2}$  and  $\sqrt{5} - \sqrt{2}$  are conjugates. The product of two conjugates results in a difference of two squares.

$$\begin{aligned}(\sqrt{5} + \sqrt{2})(\sqrt{5} - \sqrt{2}) &= (\sqrt{5})^2 - (\sqrt{2})^2 \\ &= 5 - 2 \\ &= 3\end{aligned}$$

Notice that the product of these conjugates has no radical.





# PART 3: DIVISION

**5** Simplify each expression.

**a.**  $\frac{4}{\sqrt{7} + \sqrt{5}}$

**b.**  $\frac{-4}{\sqrt{10} + \sqrt{8}}$

**c.**  $\frac{-5}{\sqrt{11} - \sqrt{3}}$



# CAN YOU?? PROVE IT!

- I can simplify radical expressions
  - Go back and finish all the blank problems 😊

## Summary

## Simplest Radical Form

A radical expression is in simplest radical form when all three statements are true.

- The radicand has no perfect-square factors other than 1.
- The radicand has no fractions.
- The denominator of a fraction has no radical.

