

## Lesson 1-4

### Example 1 Identify Properties

Name the property shown by each statement.

a.  $5 \cdot 7 \cdot 2 = 7 \cdot 5 \cdot 2$

The order of the numbers changes. This is the Commutative Property of Multiplication.

b.  $(1 + 8) + 4 = 1 + (8 + 4)$

The grouping of the numbers changes. This is the Associative Property of Addition.

c.  $100 + 0 = 100$

Zero was added to the number. This is the Additive Identity Property.

### Example 2 Mental Math

Find  $13 + 25 + 87$  mentally.

Group 13 and 87 together because  $13 + 87 = 100$ . It is easy to add to 100 mentally.

$$\begin{aligned} 13 + 25 + 87 &= (13 + 87) + 25 && \text{Commutative and Associative Properties of Addition} \\ &= 100 + 25 && \text{Add 13 and 87 mentally.} \\ &= 125 && \text{Add 100 and 25 mentally.} \end{aligned}$$

### Example 3 Find a Counterexample

State whether the following conjecture is *true* or *false*. If false, provide a counterexample.

*Subtraction of whole numbers is commutative.*

Write two subtraction expressions using the Commutative Property, and then check to see whether they are equal.

$$\begin{aligned} 18 - 7 &\stackrel{?}{=} 7 - 18 && \text{State the conjecture.} \\ 11 &\neq -11 && \text{Subtract.} \end{aligned}$$

We found a counterexample. That is,  $18 - 7 \neq 7 - 18$ . So, subtraction is *not* commutative. The conjecture is false.

**Example 4 Simplify Algebraic Expressions**

**Simplify each expression.**

**a.**      **$(c \cdot 4) \cdot 7$**

$$(c \cdot 4) \cdot 7 = c \cdot (4 \cdot 7)$$

$$= c \cdot 28$$

$$= 28c$$

Associative Property of Multiplication

Substitution Property of Equality;  $4 \cdot 7 = 28$

Commutative Property of Multiplication

**b.**      **$(m + 6) + 2$**

$$(m + 6) + 2 = m + (6 + 2)$$

$$= m + 8$$

Associative Property of Addition

Substitution Property of Equality;  $6 + 2 = 8$