PROPERTIES OF MULTIPLICATION Notice that both $4(-5)$ and $-5(4)$ have a product of -20, so $4(-5) = -5(4)$. This equation is an example of the *commutative property of multiplication*. Properties of multiplication are listed below.

KEY CONCEPT *For Your Notebook*

Properties of Multiplication

COMMUTATIVE PROPERTY The order in which you multiply two numbers does not change the product.

Algebra $a \cdot b = b \cdot a$ **Example** $4 \cdot (-5) = -5 \cdot 4$

ASSOCIATIVE PROPERTY The way you group three numbers in a product does not change the product.

Algebra $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ **Example** $(-2 \cdot 7) \cdot 4 = -2 \cdot (7 \cdot 4)$

IDENTITY PROPERTY The product of a number and 1 is that number.

Algebra $a \cdot 1 = 1 \cdot a = a$ **Example** $(-5) \cdot 1 = -5$

PROPERTY OF ZERO The product of a number and 0 is 0.

Algebra $a \cdot 0 = 0 \cdot a = 0$ **Example** $-3 \cdot 0 = 0$

PROPERTY OF −1 The product of a number and -1 is the opposite of the number.

Algebra $a \cdot (-1) = -1 \cdot a = -a$ **Example** $-2 \cdot (-1) = 2$

The identity property states that the product of a number a and 1 is a. The number 1 is called the **multiplicative identity**.

EXAMPLE 2 Identify properties of multiplication

Statement	Property illustrated
a. $(x \cdot 7) \cdot 0.5 = x \cdot (7 \cdot 0.5)$	Associative property of multiplication
b. $8 \cdot 0 = 0$	Multiplicative property of zero
c. $-6 \cdot y = y \cdot (-6)$	Commutative property of multiplication
d. $9 \cdot (-1) = -9$	Multiplicative property of -1
e. $1 \cdot v = v$	Identity property of multiplication

✓ GUIDED PRACTICE for Example 2

Identify the property illustrated.

4. $-1 \cdot 8 = -8$

5. $12 \cdot x = x \cdot 12$

6. $(y \cdot 4) \cdot 9 = y \cdot (4 \cdot 9)$

7. $0 \cdot (-41) = 0$

8. $-5 \cdot (-6) = -6 \cdot (-5)$

9. $-13 \cdot (-1) = 13$