

2.4**Algebraic Reasoning**

For use with Exploration 2.4

Essential Question How can algebraic properties help you solve an equation?

1 EXPLORATION: Justifying Steps in a Solution

Work with a partner. In previous courses, you studied different properties, such as the properties of equality and the Distributive, Commutative, and Associative Properties. Write the property that justifies each of the following solution steps.

Algebraic Step	Justification
$2(x + 3) - 5 = 5x + 4$	Write given equation.
$2x + 6 - 5 = 5x + 4$	_____
$2x + 1 = 5x + 4$	_____
$2x - 2x + 1 = 5x - 2x + 4$	_____
$1 = 3x + 4$	_____
$1 - 4 = 3x + 4 - 4$	_____
$-3 = 3x$	_____
$\frac{-3}{3} = \frac{3x}{3}$	_____
$-1 = x$	_____
$x = -1$	_____

2.4 Algebraic Reasoning (continued)**2 EXPLORATION: Stating Algebraic Properties**

Work with a partner. The symbols \blacklozenge and \bullet represent addition and multiplication (not necessarily in that order). Determine which symbol represents which operation. Justify your answer. Then state each algebraic property being illustrated.

Example of Property**Name of Property**

$$5 \blacklozenge 6 = 6 \blacklozenge 5$$

$$5 \bullet 6 = 6 \bullet 5$$

$$4 \blacklozenge (5 \blacklozenge 6) = (4 \blacklozenge 5) \blacklozenge 6$$

$$4 \bullet (5 \bullet 6) = (4 \bullet 5) \bullet 6$$

$$0 \blacklozenge 5 = 0$$

$$0 \bullet 5 = 5$$

$$1 \blacklozenge 5 = 5$$

$$4 \blacklozenge (5 \bullet 6) = 4 \blacklozenge 5 \bullet 4 \blacklozenge 6$$

Communicate Your Answer

- How can algebraic properties help you solve an equation?
- Solve $3(x + 1) - 1 = -13$. Justify each step.

2.4**Notetaking with Vocabulary**

For use after Lesson 2.4

In your own words, write the meaning of each vocabulary term.

equation

solve an equation

formula

Core Concepts**Algebraic Properties of Equality**Let a , b , and c be real numbers.**Addition Property of Equality** If $a = b$, then $a + c = b + c$.**Subtraction Property of Equality** If $a = b$, then $a - c = b - c$.**Multiplication Property of Equality** If $a = b$, then $a \cdot c = b \cdot c$, $c \neq 0$.**Division Property of Equality** If $a = b$, then $\frac{a}{c} = \frac{b}{c}$, $c \neq 0$.**Substitution Property of Equality** If $a = b$, then a can be substituted for b (or b for a) in any equation or expression.**Notes:**

2.4 Notetaking with Vocabulary (continued)**Distributive Property**Let a , b , and c be real numbers.

Sum $a(b + c) = ab + ac$

Difference $a(b - c) = ab - ac$

Notes:**Reflexive, Symmetric, and Transitive Properties of Equality**

	Real Numbers	Segment Lengths	Angle Measures
Reflexive Property	$a = a$	$AB = AB$	$m\angle A = m\angle A$
Symmetric Property	If $a = b$, then $b = a$.	If $AB = CD$, then $CD = AB$.	If $m\angle A = m\angle B$, then $m\angle B = m\angle A$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

Notes:

2.4 Notetaking with Vocabulary (continued)**Extra Practice**

In Exercises 1–3, solve the equation. Justify each step.

1. $3x - 7 = 5x - 19$

2. $20 - 2(3x - 1) = x - 6$

3. $-5(2u + 10) = 2(u - 7)$

In Exercises 4 and 5, solve the equation for the given variable. Justify each step.

4. $9x + 2y = 5; y$

5. $\frac{1}{15}s - \frac{2}{3}t = -2; s$

6. The formula for the surface area S of a cone is $S = \pi r^2 + \pi rs$, where r is the radius and s is the slant height. Solve the formula for s . Justify each step. Then find the slant height of the cone when the surface area is 113 square feet and the radius is 4 feet. Approximate to the nearest tenth.