

# Study Guide

## Commutative and Associative Properties

The commutative and associative properties can be used to simplify expressions.

| Commutative Properties  |
|---|
| For any numbers $a$ and $b$ ,<br>$a + b = b + a$ and<br>$a \cdot b = b \cdot a$ . |

| Associative Properties  |
|---|
| For any numbers $a$ , $b$ , and $c$ ,<br>$(a + b) + c = a + (b + c)$ and<br>$(ab)c = a(bc)$ . |

**Example:** Simplify  $8(y + 2x) + 7y$ .

$$\begin{aligned}
 8(y + 2x) + 7y &= (8y + 16x) + 7y \\
 &= (16x + 8y) + 7y \\
 &= 16x + (8y + 7y) \\
 &= 16x + (8 + 7)y \\
 &= 16x + 15y
 \end{aligned}$$

Distributive property

Commutative property of addition

Associative property of addition

Distributive property

Substitution property of equality

**Simplify.**

1.  $4x + 3y + x$

2.  $8r^2s + 2rs^2 + 7r^2s$

3.  $6(2x + 4y) + 2(x + 9)$

4.  $3a^2 + 4b + 10a^2$

5.  $4xy + 7x^2y + xy$

6.  $3ab + 4a^2b + 5(2a^2b)$

7.  $6(a + b) - a + 3b$

8.  $0.5(18x + 16y) + 13x$

9.  $\frac{2}{3} + \frac{1}{2}(x + 10) + \frac{4}{3}$

10.  $5(0.3x + 0.1y) + 0.2x$

11.  $5(2y + 3x) + 6(y + x)$

12.  $z^2 + 9x^2 + \frac{4}{3}z^2 + \frac{1}{3}x^2$

**Name the property illustrated by each statement.**

13.  $6x + 2y = 2y + 6x$

14.  $15(a + 4) = 15a + 15(4)$

15.  $1 \cdot b^3 = b^3$

16.  $(2c + 6) + 10 = 2c + (6 + 10)$