

## 1–2 Grouping Symbols

**Objective:** To simplify expressions with and without grouping symbols.

### Vocabulary/Symbols

**Grouping symbol** A symbol used to enclose an expression that should be simplified first. Multiplication symbols are often left out of expressions with grouping symbols. For example:

**Parentheses**  
 $6(5 - 3) = 6 \cdot 2$

**Brackets**  
 $6[5 - 3] = 6 \cdot 2$

**Fraction Bar**  
 $\frac{10 + 6}{9 - 5} = \frac{16}{4}$

**CAUTION** When there are no grouping symbols, simplify in the following order:

1. Do all multiplications and divisions in order from left to right.
2. Do all additions and subtractions in order from left to right.

**Example 1** Simplify:    a.  $8(7 - 2)$     b.  $8(7) - 2$

**Solution**    a.  $8(7 - 2)$     The parentheses tell you to simplify  $7 - 2$  first.

$$8(5) \quad 8(5) \text{ means } 8 \cdot 5.$$

$$40$$

      b.  $8(7) - 2$     Do the multiplication  $8 \cdot 7$  first.

$$56 - 2 \quad \text{Then subtract 2.}$$

$$54$$

**Simplify each expression.**

1. a.  $9(6 - 1)$

      b.  $9(6) - 1$

4. a.  $8 + 5 \cdot 2$

      b.  $(8 + 5) \cdot 2$

2. a.  $12(5 - 3)$

      b.  $12(5) - 3$

5. a.  $9 - 6 \div 3$

      b.  $(9 - 6) \div 3$

3. a.  $6 + 4 \cdot 5$

      b.  $(6 + 4) \cdot 5$

6. a.  $12 + 8 \div 4$

      b.  $(12 + 8) \div 4$

**Example 2** Simplify:    a.  $\frac{15 + 3}{9 - 3}$     b.  $\frac{8 \cdot 5 + 2}{2(8 - 5)}$

**Solution**    a.  $\frac{15 + 3}{9 - 3} = \frac{18}{6}$   
 $= 3$

Simplify the numerator and denominator first.

Then divide by 6.

      b.  $\frac{8 \cdot 5 + 2}{2(8 - 5)} = \frac{40 + 2}{2(3)}$   
 $= \frac{42}{6}$   
 $= 7$

Start to simplify the numerator and denominator.

Further simplify the numerator and denominator.

Then divide by 6.

**1-2 Grouping Symbols** (continued)

Simplify each expression.

7.  $\frac{6 + 9}{7 - 2}$       8.  $\frac{11 - 3}{2 + 6}$       9.  $\frac{15 + 3 \cdot 3}{7 + 5}$       10.  $\frac{8 \cdot 5 - 4}{3(5 - 3)}$
11.  $\frac{3(11 - 7)}{2 \cdot 5 - 4}$       12.  $\frac{6(13 - 3)}{2 \cdot 5 + 2}$       13.  $\frac{6 \cdot 3 + 2 \cdot 7}{2(9 - 5)}$       14.  $\frac{7 \cdot 4 - 2 \cdot 5}{3(5 - 3)}$

**Example 3** Evaluate each expression if  $a = 6$ ,  $b = 2$ ,  $c = 3$ , and  $d = 0$ .

a.  $a(b + c)$       b.  $\frac{8(c + d)}{a - b}$

**Solution**

a.  $a(b + c) = 6(2 + 3)$       Replace  $a$  with 6,  $b$  with 2, and  $c$  with 3.  
 $= 6(5)$       Simplify the expression within parentheses.  
 $= 30$       Multiply.

b.  $\frac{8(c + d)}{a - b} = \frac{8(3 + 0)}{6 - 2}$       Replace the variables with their given values.  
 $= \frac{8(3)}{4}$       Simplify the numerator and denominator.  
 $= \frac{24}{4}$       Divide.  
 $= 6$

Evaluate each expression if  $x = 2$ ,  $y = 4$ ,  $z = 6$ , and  $b = 5$ .

15. a.  $2x + 5$       16. a.  $5y - 1$       17. a.  $16 - 3b$       18. a.  $3z + 4$   
b.  $2(x + 5)$       b.  $5(y - 1)$       b.  $(16 - 3)b$       b.  $3(z + 4)$
19. a.  $bx + y$       20. a.  $xz - b$       21. a.  $2xy + z$       22. a.  $6xyz - b$   
b.  $b(x + y)$       b.  $x(z - b)$       b.  $2(xy + z)$       b.  $6x(yz - b)$
23.  $5(4y - 3x)$       24.  $6z - 2xy$       25.  $xyz - 5$       26.  $x(y \cdot y + z)$
27.  $\frac{9x + z}{x + z}$       28.  $\frac{8x - z}{z - b}$       29.  $\frac{9y - z}{5(b - y)}$       30.  $\frac{2(x + y)}{x + y}$

**Mixed Review Exercises**

Simplify.

1.  $(12 - 6) \div 3$       2.  $20 \cdot 8 + 18 \cdot 2$       3.  $5 \times (25 - 7)$   
4.  $9 + 15 \div 3$       5.  $(25 + 3) \div (8 \div 2)$       6.  $(7 + 5) \cdot (8 - 2)$

Evaluate each expression if  $a = 2$ ,  $b = 3$ , and  $c = 4$ .

7.  $5ab$       8.  $bc$       9.  $(2c) - 3$   
10.  $\frac{a + c}{c - a}$       11.  $(7a) - (4b)$       12.  $6a$