

161. (a)  $12x^8$  is already in simplified form.

(b)  $12(x^3)^5 = 12x^{15}$

(c)  $12x^3x^5 = 12x^8$

(d)  $3 \cdot 2(x^2)^4 = 3 \cdot 4x^8 = 12x^8$

(e)  $3 \cdot 5x^8 = 15x^8$

Thus, (a), (c), and (d) are equivalent.

165. To remove nested symbols of grouping, remove the innermost grouping symbols first and combine like terms.

163. To combine like terms, add their coefficients and attach the common variable factor.

Examples:

$$5a + 7b - 2a + b = 3a + 8b$$

$$2x^2 - 7x + 10x = 2x^2 + 3x$$

167.  $[x - (3 \cdot 4)] \div 5 = \frac{x - 12}{5}$

$$[x - 3 \cdot 4] \div 5 = \frac{x - 12}{5}$$

If the parentheses are removed, the expression is unchanged because multiplication is a higher-order operation than subtraction.

$$x - (3 \cdot 4) \div 5 = x - \frac{12}{5}$$

If the brackets are removed, the expression is changed because division is a higher-order operation than subtraction.

## Mid-Chapter Quiz for Chapter 2

1. (a) If  $x = 3$ , the value of  $x^2 - 3x$  is  $3^2 - 3(3) = 9 - 9 = 0$ .

(b) If  $x = -2$ , the value of  $x^2 - 3x$  is  $(-2)^2 - 3(-2) = 4 + 6 = 10$ .

(c) If  $x = 0$ , the value of  $x^2 - 3x$  is  $0^2 - 3(0) = 0 - 0 = 0$ .

2. (a) If  $x = 2$  and  $y = 4$ , the value of  $\frac{x}{y-3}$  is  $\frac{2}{4-3} = \frac{2}{1} = 2$ .

(b) If  $x = 0$  and  $y = -1$ , the value of  $\frac{x}{y-3}$  is  $\frac{0}{-1-3} = \frac{0}{-4} = 0$ .

(c) If  $x = 5$  and  $y = 3$ , the value of  $\frac{x}{y-3}$  is undefined because  $\frac{5}{3-3} = \frac{5}{0}$  and division by zero is undefined.

3. (a) The coefficient is  $-5$ .

(b) The coefficient is  $\frac{5}{16}$ .

4. (a)  $3y \cdot 3y \cdot 3y \cdot 3y = (3y)^4$

(b)  $2 \cdot (x - 3)(x - 3)2 \cdot 2 = 2^3(x - 3)^2$

5.  $x^4 \cdot x^3 = x^{4+3} = x^7$

6.  $(v^2)^5 = v^{2(5)}v^{10}$

7.  $(-3y)^2y^3 = (-3)^2y^2y^3$   
 $= 9y^{2+3}$   
 $= 9y^5$

8.  $8(x - 4)^2(x - 4)^4 = 8(x - 4)^{2+4}$   
 $= 8(x - 4)^6$

9.  $\frac{2z^2}{3y} \cdot \frac{5z}{7y^3} = \frac{2z^2(5z)}{3y(7y^3)} = \frac{10z^3}{21y^4}$

10.  $\left(\frac{x}{y}\right)^2\left(\frac{x}{y}\right)^5 = \left(\frac{x}{y}\right)^{2+5} = \left(\frac{x}{y}\right)^7$

11. Associative Property  
Multiplication

12. Distributive Property

13. Multiplicative Inverse  
Property

14. Commutative Property  
of Addition

$$\begin{aligned} 15. \quad 2(3x - 1) &= 2(3x) - 2(1) \\ &= 6x - 2 \end{aligned}$$

$$\begin{aligned} 16. \quad -4(2y - 3) &= -4(2y) - (-4)(3) \\ &= -8y + 12 \end{aligned}$$

$$\begin{aligned} 17. \quad y^2 - 3xy + y + 7xy &= y^2 + (-3 + 7)xy + y \\ &= y^2 + 4xy + y \end{aligned}$$

$$\begin{aligned} 18. \quad 10\left(\frac{1}{u}\right) - 7\left(\frac{1}{u}\right) + 3u &= (10 - 7)\left(\frac{1}{u}\right) + 3u \\ &= 3\left(\frac{1}{u}\right) + 3u \end{aligned}$$

$$\begin{aligned} 19. \quad 5(a - 2b) + 3(a + b) &= 5a - 10b + 3a + 3b \\ &= (5 + 3)a + (-10 + 3)b \\ &= 8a - 7b \end{aligned}$$

$$\begin{aligned} 20. \quad 4x + 3[2 - 4(x + 6)] &= 4x + 3[2 - 4x - 24] \\ &= 4x + 3[-22 - 4x] \\ &= 4x - 66 - 12x \\ &= (4 - 12)x - 66 \\ &= -8x - 66 \end{aligned}$$

$$21. \quad \left(\frac{1}{3}\pi r^2 h\right)\left(\frac{3}{10}r^2\right) = \frac{1\cancel{3}}{\cancel{3}(10)}\pi r^{2+2}h = \frac{1}{10}\pi r^4 h$$

$$\begin{aligned} 22. \quad 4 \cdot 10^4 + 5 \cdot 10^3 + 7 \cdot 10^2 &= 4 \cdot 10,000 + 5 \cdot 1,000 + 7 \cdot 100 \\ &= 40,000 + 5,000 + 700 \\ &= 45,700 \end{aligned}$$

## Section 2.3 Algebra and Problem Solving

- |  |  |   |                    |                               |
|--|--|---|--------------------|-------------------------------|
| 1. (d)   | 3. (e)   | 5. (b)  | 7. $x + 5$         | 9. $x - 25$                   |
| 11. $x - 6$  | 13. $2x$   | 15. $\frac{x}{3}$   | 17. $\frac{x}{50}$ | 19. $\frac{3}{10}x$ or $0.3x$ |
| 21. $3x + 5$   | 23. $8 + 5x$   | 25. $10(x + 4)$   | 27. $ x + 4 $      | 29. $x^2 + 1$                 |
| 31. A number decreased by ten.   | 33. A number is tripled and the product is increased by two. | 35. A number is multiplied by seven and the product is increased by four. |                    |                               |
| 37. A number is subtracted from 2 and the difference is multiplied by 3<br>or<br>Three times the difference of 2 and a number. | 39. A number is increased by 1 and the sum is divided by 2.  | 41. The square of a number is increased by 5.                             |                    |                               |
| 43. $(x + 3)x = x^2 + 3x$  | 45. $(25 + x) + x = 25 + x + x$<br>$= 25 + 2x$               | 47. $(x - 9)3 = 3x - 27$  |                    |                               |