

18. (a) $(7 + y) - z = 7 + (y - z)$ Associative Property of Addition

(b) $2x \cdot 1 = 2x$ Multiplicative Identity Property

19. $1522.76 - 328.37 - 65.99 - 50.00 + 413.88 = \1492.28

20. $(\$30)(2)(12)(5) = \3600

21. $1 = \frac{1}{3} + \frac{1}{4} + \frac{1}{8} + x$

$$1 - \frac{1}{3} - \frac{1}{4} - \frac{1}{8} = x$$

$$\frac{24}{24} - \frac{8}{24} - \frac{6}{24} - \frac{3}{24} = x$$

$$\frac{7}{24} = x$$

The sum of the parts of a circle is equal to 1.

Section P.4 Algebraic Expressions

1. Terms: $10x$, 5

3. Terms: $-3y^2$, $2y$, -8

5. Terms: $4x^2$, $-3y^2$, $-5x$, $2y$

7. Terms: x^2 , $-2.5x$, $-\frac{1}{x}$

9. The coefficient of $5y^3$ is 5.

11. The coefficient of $-\frac{3}{4}t^2$ is $-\frac{3}{4}$.

13. $4 - 3x = -3x + 4$ illustrates the Commutative Property of Addition

15. $-5(2x) = (-5 \cdot 2)x$ illustrates the Associative Property of Multiplication

17. $5(x + 6) = 5x + 30$

19. $6x + 6 = 6(x + 1)$

21. $x^3 \cdot x^4 = x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$

23. $z^2 \cdot z^5 = z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z$

25. $(-5x)(-5x)(-5x)(-5x) = (-5x)^4$

27. $(x \cdot x \cdot x)(y \cdot y \cdot y) = x^3y^3$

29. $-2^3 \cdot 2^4 = -2^{3+4}$
 $= -2^7$

31. $x^5 \cdot x^7 \cdot x = x^{5+7+1} = x^{13}$

33. $3^3y^4 \cdot y^2 = 3^3y^{4+2} = 27y^6$

35. $(-4x)^2 = (-4)^2 \cdot x^2 = 16x^2$

37. $-4(2x)^2 = -4(4x^2)$
 $= -16x^2$

39. $(-5z^2)^3 = (-5z^2)(-5z^2)(-5z^2)$
 $= (-5 \cdot -5 \cdot -5)(z^{2+2+2})$
 $= -125z^6$

41. $(2xy)(3x^2y^3) = (2 \cdot 3) \cdot (x \cdot x^2) \cdot (y \cdot y^3)$
 $= 6 \cdot (x^{1+2}) \cdot (y^{1+3})$
 $= 6x^3y^4$

43. $(5y^2)(-y^4)(2y^3) = (5 \cdot -1 \cdot 2)(y^{2+4+3})$
 $= -10y^9$

45. $-5z^4(-5z)^4 = -5z^4(625z^4)$
 $= (-5 \cdot 625)(z^{4+4})$
 $= -3125z^8$

$$\begin{aligned}
 47. (-2a^2)^3(-8a) &= (-8a^6)(-8a) \\
 &= (-8 \cdot -8)(a^{6+1}) \\
 &= 64a^7
 \end{aligned}$$

$$51. (x^n)^4 = x^{n \cdot 4} = x^{4n}$$

$$55. 3x + 4x = (3 + 4)x = 7x$$

$$\begin{aligned}
 59. 3x - 2y + 5x + 20y &= (3x + 5x) + (-2y + 20y) \\
 &= (3 + 5)x + (-2 + 20)y \\
 &= 8x + 18y
 \end{aligned}$$

$$\begin{aligned}
 63. -3z^4 + 6z - z + 8 + z^4 &= -3z^4 + z^4 + 6z - z + 8 \\
 &= (-3 + 1)z^4 + (6 - 1)z + 8 \\
 &= -2z^4 + 5z + 8
 \end{aligned}$$

$$67. 4(2x^2 + x - 3) = 8x^2 + 4x - 12$$

$$\begin{aligned}
 71. 10(x - 3) + 2x - 5 &= 10x - 30 + 2x - 5 \\
 &= (10x + 2x) + (-30 - 5) \\
 &= (10 + 2)x + (-30 - 5) \\
 &= 12x - 35
 \end{aligned}$$

$$\begin{aligned}
 75. -3(y^2 - 2) + y^2(y + 3) &= -3y^2 + 6 + y^3 + 3y^2 \\
 &= (-3 + 3)y^2 + 6 + y^3 \\
 &= 6 + y^3
 \end{aligned}$$

$$\begin{aligned}
 79. 3[2x - 4(x - 8)] &= 3[2x - 4x + 32] \\
 &= 3[-2x + 32] \\
 &= -6x + 96
 \end{aligned}$$

$$\begin{aligned}
 83. 2[3(b - 5) - (b^2 + b + 3)] &= 2[3b - 15 - b^2 - b - 3] \\
 &= 6b - 30 - 2b^2 - 2b - 6 \\
 &= (-2b^2) + (6b - 2b) + (-30 - 6) \\
 &= -2b^2 + 4b - 36
 \end{aligned}$$

$$\begin{aligned}
 49. (3uv)^2(-6u^3v) &= (3^2u^2v^2)(-6u^3v) \\
 &= (3^2 \cdot -6) \cdot (u^2 \cdot u^3) \cdot (v^2 \cdot v) \\
 &= (9 \cdot -6) \cdot (u^{2+3}) \cdot (v^{2+1}) \\
 &= -54u^5v^3
 \end{aligned}$$

$$53. x^{n+1} \cdot x^3 = x^{n+1+3} = x^{n+4}$$

$$57. 9y - 5y + 4y = (9 - 5 + 4)y = 8y$$

$$\begin{aligned}
 61. 7x^2 - 2x - x^2 &= 7x^2 - x^2 - 2x \\
 &= (7 - 1)x^2 - 2x \\
 &= 6x^2 - 2x
 \end{aligned}$$

$$\begin{aligned}
 65. 2uv + 5u^2v^2 - uv - (uv)^2 &= (2uv - uv) + (5u^2v^2 - u^2v^2) \\
 &= (2 - 1)uv + (5 - 1)u^2v^2 \\
 &= uv + 4u^2v^2
 \end{aligned}$$

$$69. -3(6y^2 - y - 2) = -18y^2 + 3y + 6$$

$$\begin{aligned}
 73. -3(3y - 1) + 2(y - 5) &= -9y + 3 + 2y - 10 \\
 &= -9y + 2y + 3 - 10 \\
 &= (-9 + 2)y - 7 \\
 &= -7y - 7
 \end{aligned}$$

$$\begin{aligned}
 77. y^2(y + 1) + y(y^2 + 1) &= y^3 + y^2 + y^3 + y \\
 &= (y^3 + y^3) + (y^2) + (y) \\
 &= 2y^3 + y^2 + y
 \end{aligned}$$

$$\begin{aligned}
 81. 8x + 3x[10 - 4(3 - x)] &= 8x + 3x[10 - 12 + 4x] \\
 &= 8x + 3x[-2 + 4x] \\
 &= 8x - 6x + 12x^2 \\
 &= 2x + 12x^2
 \end{aligned}$$

$$\begin{aligned}
 85. \quad 2x(5x^2) - 4x^3(x + 15) &= 10x^3 - 4x^4 - 60x^3 \\
 &= -(10 - 60)x^3 - 4x^4 \\
 &= -4x^4 - 50x^3
 \end{aligned}$$

$$\begin{aligned}
 89. \quad (a) \quad \text{Substitution: } 10 - 4(-1)^2 \\
 \text{Value of expression: } 10 - 4 = 6
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \text{Substitution: } 10 - 4\left(\frac{1}{2}\right)^2 \\
 \text{Value of expression: } 10 - 4\left(\frac{1}{4}\right) = 10 - 1 = 9
 \end{aligned}$$

$$\begin{aligned}
 93. \quad (a) \quad \text{Substitution: } 3(1) + 2(5) \\
 \text{Value of expression: } 13
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \text{Substitution: } 3(-6) + 2(-9) \\
 \text{Value of expression: } -36
 \end{aligned}$$

$$\begin{aligned}
 95. \quad (a) \quad \text{Substitution: } 2^2 - (2)(-1) + (-1)^2 = 4 - (-2) + 1 \\
 = 7
 \end{aligned}$$

Value of expression: 7

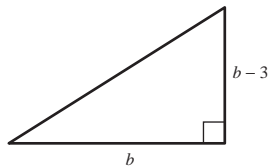
$$\begin{aligned}
 (b) \quad \text{Substitution: } (-3)^2 - (-3)(-2) + (-2)^2 = 9 - 6 + 4 \\
 = 7
 \end{aligned}$$

Value of expression: 7

$$\begin{aligned}
 97. \quad (a) \quad \text{Substitution: } |5 - 2| = |3| = 3 \\
 \text{Value of expression: } 3
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \text{Substitution: } |-2 - (-2)| = |-2 + 2| = |0| = 0 \\
 \text{Value of expression: } 0
 \end{aligned}$$

$$\begin{aligned}
 101. \quad A &= \frac{1}{2}b(b - 3) \\
 A &= \frac{1}{2}(15)(15 - 3) \\
 &= \frac{1}{2}(15)(12) \\
 &= 90
 \end{aligned}$$



$$87. \quad (a) \quad \text{Substitution: } 5 - 3\left(\frac{2}{3}\right)$$

Value of expression: 3

$$(b) \quad \text{Substitution: } 5 - 3(5)$$

Value of expression: -10

$$91. \quad (a) \quad \text{Substitution: } \frac{0}{0^2 + 1}$$

Value of expression: 0

$$(b) \quad \text{Substitution: } \frac{3}{3^2 + 1}$$

Value of expression: $\frac{3}{10}$

$$99. \quad (a) \quad \text{Substitution: } 40\left(5\frac{1}{4}\right)$$

Value of expression: 210

$$(b) \quad \text{Substitution: } 35(4)$$

Value of expression: 140

$$103. \quad A = lw$$

$$A = (2x + 3)x$$

$$A = 2x^2 + 3x$$

105. Graphically, the sales in 1995 is approximately \$2800 million.

Let $t = 5$.

$$\begin{aligned}
 \text{Sales} &= 193.89(5) + 1830.89 \\
 &= 969.45 + 1830.89 \\
 &= \$2800.34
 \end{aligned}$$

107. Graphically, the median sale price in 1995 is approximately \$134 thousand.

Let $t = 5$.

$$\begin{aligned}
 \text{Sale price} &= 5.9(5) + 106.0 \\
 &= 29.5 + 106.0 \\
 &= \$135.5 \text{ thousand}
 \end{aligned}$$

109.
$$\boxed{\text{Total area}} = 2 \cdot \boxed{\text{Area of trapezoid}} + 2 \cdot \boxed{\text{Area of triangle}}$$

$$\text{Area} = \left[\frac{1}{2} \cdot h(b_1 + b_2) \right] + 2 \left[\frac{1}{2} \cdot b \cdot h \right]$$

$$\begin{aligned} \text{Area} &= 12(60 + 40) + 20 \cdot 12 \\ &= 12(100) + 240 \\ &= 1200 + 240 \\ &= 1440 \text{ square feet} \end{aligned}$$

111. (d) $(0 + 3 + 1 + 2 + 6 + 7)3 + (4 + 8 + 9 + 3 + a)$

(e) $81 + a$, the next-highest multiple of 10 will be 90.

$$90 - (81 + a) = 4 \qquad 9 - a = 4 \qquad a = 5$$

$$90 - 81 - a = 4 \qquad -a = -5 \qquad \text{No. The work shows the only possible answer.}$$

113. To combine like terms add (or subtract) their respective coefficients and attach the common variable factor.

Example: $5x^4 - 3x^4 = (5 - 3)x^4 = 2x^4$

115. The Distributive Property is used to simplify $5x + 3x$ as follows: $5x + 3x = (5 + 3)x = 8x$.

117. It is not possible to evaluate $\frac{x+2}{y-3}$ when $x = 5$ and $y = 3$ because $\frac{7}{0}$ is undefined.

Section P.5 Constructing Algebraic Expressions

1. The sum of 8 and a number n is translated into the algebraic expression $8 + n$.

3. The sum of 12 and twice a number n is translated into the algebraic expression $12 + 2n$.

5. Six less than a number n is translated into the algebraic expression $n - 6$.

7. Four times a number n minus 3 is translated into the algebraic expression $4n - 3$.

9. One-third of a number n is translated into the algebraic expression $\frac{1}{3}n$.

11. The quotient of a number x and 6 is translated into the algebraic expression $\frac{x}{6}$.

13. Eight times the ratio of N and 5 is translated into the algebraic expression $8 \cdot \frac{N}{5}$.

15. The number c is quadrupled and the product is increased by 10 is translated into the algebraic expression $4c + 10$.

17. Thirty percent of the list price L is translated into the algebraic expression $0.30L$.

19. The sum of a number and 5 divided by 10 is translated into the algebraic expression $\frac{n+5}{10}$.

21. The absolute value of the difference between a number and 5 is translated into the algebraic expression $|n - 5|$.

23. The product of three and the square of a number decreased by 4 is translated into the algebraic expression $3x^2 - 4$.