

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

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

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

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

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

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

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

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

## 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. $(x - 9)3 = 3x - 27$  |                    |                               |

49.  $\frac{8(x + 24)}{2} = \frac{8x + 192}{2}$   
 $= 4x + 96$

51. The amount of money is a product.

Verbal model: 

Value of dime
---------------

 · 

Number of dimes
-----------------

  
 Labels: Value of dime = 0.10 (dollars)  
 Number of dimes =  $d$   
 Algebraic expression:  $0.10d$  (dollars)

53. The amount of sales tax is a product.

Verbal model: 

Percent of sales tax
----------------------

 · 

Amount of purchase
--------------------

  
 Labels: Percent of sales tax = 0.06 (in decimal form)  
 Amount of purchase =  $L$  (dollars)  
 Algebraic expression:  $0.06L$  (dollars)

55. The travel time is a quotient.

Verbal model: 

Distance traveled
-------------------

Average speed
---------------

  
 Labels: Distance traveled = 100 (miles)  
 Average speed =  $r$  (miles per hour)  
 Algebraic expression:  $\frac{100}{r}$  (hours)

57. The camping fee is a sum of products.

Verbal model: 

Fee per parent
----------------

 · 

Number of parents
-------------------

 + 

Fee per child
---------------

 · 

Number of children
--------------------

  
 Labels: Fee per parent = 15 (dollars)  
 Number of parents =  $m$   
 Fee per child = 2 (dollars)  
 Number of children =  $n$   
 Algebraic expression:  $15m + 2n$

59. Guesses will vary.

$t = 10.2$  years

61. Guesses will vary.

$t = 11.9$  years

63.

$n$	0	1	2	3	4	5
$2n - 1$	-1	1	3	5	7	9
Differences		2	2	2	2	2

All entries in the third row are 2's. The value of the expression  $2n - 1$  increases by 2 for each increase of 1 in the value of  $n$ . Note that 2 is the coefficient of  $n$  in the expression  $2n - 1$ .

65. In Exercise 63, all entries in the third row are 2's, and 2 is the coefficient of  $n$  in the expression  $2n - 1$ . If the algebraic expression were  $3n + 5$ , all the entries in the third row would be 3's.

67. The difference in the last row are all 5's. Thus, the coefficient of  $n$  must be 5. However,  $5(0) - 0$ ,  $5(1) = 5$ ,  $5(2) = 10$ ,  $5(3) = 15$ , etc. In each instance, the value of  $an + b$  is 4 more than 5 times  $n$ . Therefore, the expression  $an + b$  must be  $5n + 4$ . This indicates that  $a = 5$  and  $b = 4$ .

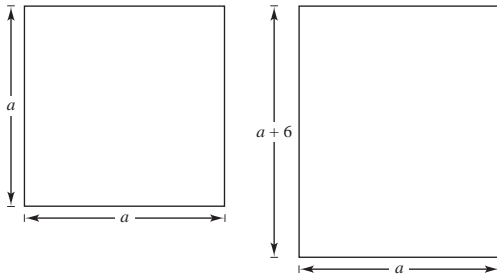
69. The area of a rectangle is the product of the length and width of the rectangle.

$3x(6x - 1) = 18x^2 - 3x$

71. The area of a triangle is one-half the product of the base and height of the triangle.

$$\begin{aligned} \frac{1}{2}(12)(5x^2 + 2) &= 6(5x^2 + 2) \\ &= 30x^2 + 12 \end{aligned}$$

73.



Perimeter of the square:  $4a$  centimeters  
 Area of the square:  $a^2$  square centimeters  
 Perimeter of the rectangle:  $2(a) + 2(a + 6) = 2a + 2a + 12 = 4a + 12$  centimeters  
 Area of the rectangle:  $a(a + 6) = a^2 + 6a$  square centimeters

75. The area of the screen is a product.

Verbal model: 

Length of screen
------------------

 $\cdot$ 

Width of screen
-----------------

  
 Labels: Length of screen =  $s$  (inches)  
 Width of screen =  $s$  (inches)  
 Algebraic expression:  $s \cdot s$  or  $s^2$  (square inches)

77. The perimeter is a sum of products.

Verbal model: 

2
---

 $\cdot$ 

Length of frame
-----------------

 + 

2
---

 $\cdot$ 

Width of frame
----------------

  
 Labels: Length of frame =  $1.5w$   
 Width of frame =  $w$   
 Algebraic expression:  $2(1.5w) + 2 \cdot w = 3w + 2w = 5w$

79. (a)  $m + n$

- (b)  $1 + 2 = 3$
- $2 + 3 = 5$
- $3 + 5 = 8$
- $5 + 8 = 13$
- $8 + 13 = 21$

So, the next five Fibonacci numbers are 3, 5, 8, 13, and 21.

81. Subtraction

83. (a), (b), and (e)

Note: (c)  $n$  less than 4 would be equivalent to  $4 - n$

(d) the ratio of  $n$  to 4 would be equivalent to  $\frac{n}{4}$ .

85.  $3\left(\frac{5}{n}\right)$  or  $\frac{5}{3n}$