

Alg 2

1 Equations and Inequalities

- 1.1 Apply Properties of Real Numbers
- 1.2 Evaluate and Simplify Algebraic Expressions
- 1.3 Solve Linear Equations
- 1.4 Rewrite Formulas and Equations
- 1.5 Use Problem Solving Strategies and Models
- 1.6 Solve Linear Inequalities
- 1.7 Solve Absolute Value Equations and Inequalities

Before

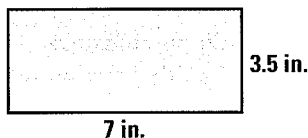
In previous courses, you learned the following skills, which you'll use in Chapter 1: simplifying numerical expressions, using formulas, and writing algebraic expressions.

Prerequisite Skills

VOCABULARY CHECK

Copy and complete the statement.

1. The **area** of the rectangle is ?.
2. The **perimeter** of the rectangle is ?.
3. The **opposite** of any number a is ?.



SKILLS CHECK

Perform the indicated operation. (Review p. 975 for 1.1, 1.2.)

4. $5 \cdot (-3)$ 5. $3 + (-4)$ 6. $-28 \div (-7)$ 7. $8 - (-15)$

Find the area of the figure. (Review pp. 991–992 for 1.4.)

8. A square with side length 7 ft 9. A circle with radius 3 m

Write an expression to answer the question. (Review p. 984 for 1.5.)

10. How much is a 15% tip on a restaurant bill of x dollars?
11. You have \$15 and buy r raffle tickets for \$.50 each. How much money do you have left?

@HomeTutor Prerequisite skills practice at classzone.com

Now

In Chapter 1, you will apply the big ideas listed below and reviewed in the Chapter Summary on page 60. You will also use the key vocabulary listed below.

Big Ideas

- 1 Using properties to evaluate and simplify expressions
- 2 Using problem solving strategies and verbal models
- 3 Solving linear and absolute value equations and inequalities

KEY VOCABULARY

- reciprocal, p. 4
- power, p. 10
- exponent, p. 10
- base, p. 10
- variable, p. 11
- coefficient, p. 12
- like terms, p. 12
- equivalent expressions, p. 12
- linear equation, p. 18
- equivalent equations, p. 18
- solve for a variable, p. 26
- linear inequality, p. 41
- compound inequality, p. 41
- absolute value, p. 51
- extraneous solution, p. 52

Why?

You can use equations to solve problems about work rates. For example, if two people complete a job at different rates, you can find how long it will take them if they work together.

Animated Algebra

The animation illustrated below for Exercise 76 on page 24 helps you answer this question: If two people paint a community mural at different rates, how long will it take them to complete the mural if they work together?

The screenshot shows an interactive animation window. On the left, a video player shows a group of people painting a mural. Below the video is a text box: "You want to paint a mural covering a given area. You can work with a friend." On the right, a control panel contains the following elements:

- Radio buttons for "You alone", "Friend alone", and "Both you and your friend".
- A table for entering worker rates:

Worker	Worker rate
You	
Friend	

- A slider for "Amount of time worked" set to 103:00.
- A progress bar for "Amount of job finished".
- Input fields for "Enter your work rates, then find how long it takes working alone or with your friend."

Animated Algebra at classzone.com

Other animations for Chapter 1: pages 5, 11, 20, 27, 34, 42, and 53

1.1 EXERCISES

HOMEWORK KEY

- = **WORKED-OUT SOLUTIONS**
on p. WS1 for Exs. 21, 31, and 59
- ★ = **STANDARDIZED TEST PRACTICE**
Exs. 2, 9, 10, 23, 24, 60, and 61

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: The ? of any nonzero number b is $\frac{1}{b}$.

2. ★ **WRITING** Express the associative property of addition in words.

EXAMPLE 1

on p. 2
for Exs. 3–8

GRAPHING NUMBERS Graph the numbers on a number line.

3. $-\frac{3}{4}, 5, \frac{9}{2}, -2, -1$

4. $-3, \frac{5}{2}, 2, -\frac{9}{4}, 4$

5. $1, \sqrt{3}, -\frac{2}{3}, -\frac{5}{4}, 2$

6. $6, -\sqrt{5}, 2.7, -2, \frac{7}{3}$

7. $-0.4, \frac{3}{2}, 0, \sqrt{10}, -1$

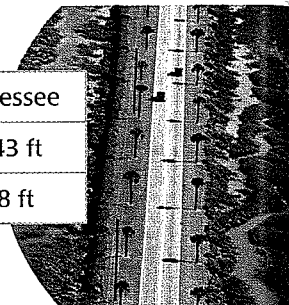
8. $-1.7, 5, \frac{9}{2}, -\sqrt{8}, -3$

EXAMPLE 2

on p. 3
for Exs. 9–10

ORDERING NUMBERS In Exercises 9 and 10, use the table of elevations below.

State	Alabama	California	Kentucky	Louisiana	Tennessee
Highest elevation	2407 ft	14,494 ft	4145 ft	535 ft	6643 ft
Lowest elevation	0 ft	-282 ft	257 ft	-8 ft	178 ft



Louisiana bayou

9. ★ **MULTIPLE CHOICE** Which list shows the highest elevations in order from least to greatest?

(A) 2407; 14,494; 4145; 535; 6643

(B) 535; 2407; 4145; 6643; 14,494

(C) 14,494; 2407; 4145; 535; 6643

(D) 14,494; 6643; 4145; 2407; 535

10. ★ **MULTIPLE CHOICE** Which list shows the lowest elevations in order from greatest to least?

(A) 0, -8, 178, 257, -282

(B) -282, -8, 0, 178, 257

(C) -282, 257, 178, -8, 0

(D) 257, 178, 0, -8, -282

EXAMPLE 3

on p. 4
for Exs. 11–16

IDENTIFYING PROPERTIES Identify the property that the statement illustrates.

11. $(4 + 9) + 3 = 4 + (9 + 3)$

12. $15 \cdot 1 = 15$

13. $6 \cdot 4 = 4 \cdot 6$

14. $5 + (-5) = 0$

15. $7(2 + 8) = 7(2) + 7(8)$

16. $(6 \cdot 5) \cdot 7 = 6 \cdot (5 \cdot 7)$

EXAMPLE 4

on p. 4
for Exs. 17–22

USING PROPERTIES Use properties and definitions of operations to show that the statement is true. *Justify* each step.

17. $6 \cdot (a \div 3) = 2a$

18. $15 \cdot (3 \div b) = 45 \div b$

19. $(c - 3) + 3 = c$

20. $(a + b) - c = a + (b - c)$

21. $7a + (4 + 5a) = 12a + 4$

22. $(12b + 15) - 3b = 15 + 9b$

23. ★ **OPEN-ENDED MATH** Find values of a and b such that a is a whole number, b is a rational number but not an integer, and $a \div b = -8$.

24. ★ **OPEN-ENDED MATH** Write three equations using integers to illustrate the distributive property.

EXAMPLE 5
on p. 5
for Exs. 25–30

OPERATIONS AND UNIT ANALYSIS Solve the problem. Use unit analysis to check your work.

25. You work 10 hours and earn \$85. What is your earning rate?
26. You travel 60 kilometers in 1.5 hours. What is your average speed?
27. You work for 5 hours at \$7.25 per hour. How much do you earn?
28. You buy 6 gallons of juice at \$1.25 per gallon. What is your total cost?
29. You drive for 3 hours at 65 miles per hour. How far do you go?
30. You ride in a train for 175 miles at an average speed of 50 miles per hour. How many hours does the trip take?

EXAMPLE 6
on p. 5
for Exs. 31–40

CONVERSION OF MEASUREMENTS Perform the indicated conversion.

- | | |
|----------------------------|------------------------------|
| 31. 350 feet to yards | 32. 15 meters to millimeters |
| 33. 2.2 kilograms to grams | 34. 5 hours to minutes |
| 35. 7 quarts to gallons | 36. 3.5 tons to pounds |
| 37. 56 ounces to tons | 38. 6800 seconds to hours |

 at classzone.com

ERROR ANALYSIS Describe and correct the error in the conversion.

39.
$$25 \text{ dollars} \cdot \frac{1 \text{ dollar}}{0.82 \text{ euro}} \approx 30.5 \text{ euros}$$



40.
$$5 \text{ pints} \cdot \frac{1 \text{ cup}}{2 \text{ pints}} = 2.5 \text{ cups}$$



CONVERSION OF RATES Convert the rate into the given units.

- | | |
|----------------------------------|------------------------------------|
| 41. 20 mi/h to feet per second | 42. 6 ft/sec to miles per hour |
| 43. 50 km/h to miles per hour | 44. 40 mi/h to kilometers per hour |
| 45. 1 gal/h to ounces per second | 46. 6 oz/sec to gallons per hour |
47. **ROCKET SLED** On a track at an Air Force base in New Mexico, a rocket sled travels 3 miles in 6 seconds. What is the average speed in miles per hour?
48. **ELEVATOR SPEED** The elevator in the Washington Monument takes 60 seconds to rise 500 feet. What is the average speed in miles per hour?

REASONING Tell whether the statement is *always*, *sometimes*, or *never* true for real numbers a , b , and c . Explain your answer.

- | | | |
|---|---|---------------------------------|
| 49. $(a + b) + c = a + (b + c)$ | 50. $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ | 51. $(a - b) - c = a - (b - c)$ |
| 52. $(a \div b) \div c = a \div (b \div c)$ | 53. $a(b - c) = ab - ac$ | 54. $a(b \div c) = ab \div ac$ |
55. **REASONING** Show that $\frac{a}{b} \div \frac{c}{d} = \frac{a}{c} \div \frac{b}{d}$ for nonzero real numbers a , b , c , and d . Justify each step in your reasoning.
56. **CHALLENGE** Let $\frac{a}{b}$ and $\frac{c}{d}$ be two distinct rational numbers. Find the rational number that lies exactly halfway between $\frac{a}{b}$ and $\frac{c}{d}$ on a number line.

PROBLEM SOLVING

EXAMPLE 2
on p. 3
for Exs. 57–59

57. **MINIATURE GOLF** The table shows the scores of people playing 9 holes of miniature golf.

Lance	+2	+1	0	0	-1	+1	+3	0	0
Darcy	-1	+3	0	-1	+1	0	0	+1	-1
Javier	+1	0	+1	0	0	-1	+1	0	+1
Sandra	-1	-1	0	0	+1	-1	0	0	0

- a. Find the sum of the scores for each player.
- b. List the players from best (lowest) to worst (highest) total score.

@HomeTutor for problem solving help at classzone.com

58. **VOLCANOES** The following list shows the elevations (in feet) of several volcano summits above or below sea level.

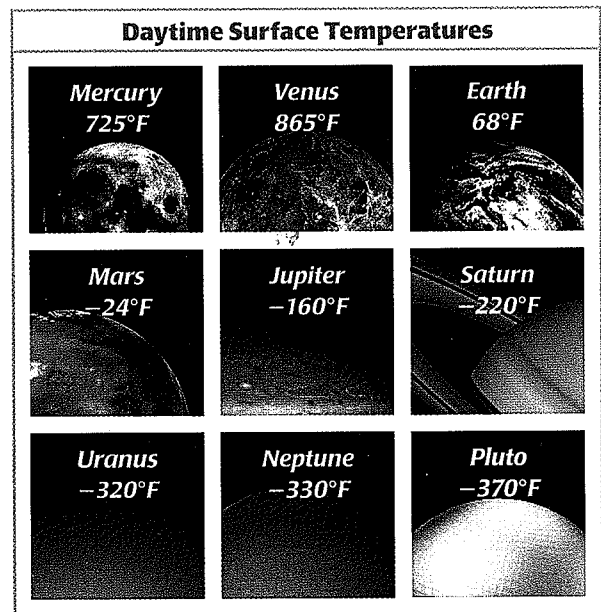
641, 3976, 610, -59, 1718, 1733, -137

Order the elevations from lowest to highest.

@HomeTutor for problem solving help at classzone.com

59. **MULTI-STEP PROBLEM** The chart shows the average daytime surface temperatures on the planets in our solar system.

- a. **Sort by Temperature** List the planets in order from least to greatest daytime surface temperature.
- b. **Sort by Distance** List the planets in order from least to greatest distance from the sun.
- c. **Find Patterns** What pattern do you notice between surface temperature and distance from the sun?
- d. **Analyze** Which planet does not follow the general pattern you found in part (c)?



EXAMPLES
5 and 6
on p. 5
for Exs. 60–61

60. **★ EXTENDED RESPONSE** The average weight of the blue whale (the largest mammal) is 120 tons, and the average weight of the bumblebee bat (the smallest mammal) is 0.07 ounce.

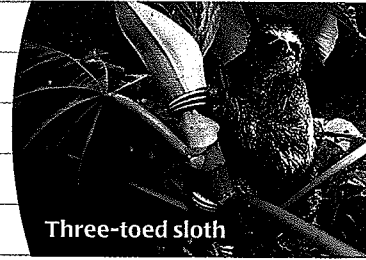
- a. **Convert** Convert the weight of the blue whale from tons to pounds. Convert the weight of the bumblebee bat from ounces to pounds.
- b. **Compare** About how many times as heavy as the bat is the blue whale?
- c. **Find a Method** Besides converting the weights to pounds, what is another method for comparing the weights of the mammals?

= **WORKED-OUT SOLUTIONS**
on p. WS1

★ = STANDARDIZED
TEST PRACTICE

61. ★ **SHORT RESPONSE** The table shows the maximum speeds of various animals in miles per hour or feet per second.

Animal	Speed (mi/h)	Speed (ft/s)
Cheetah	70	?
Three-toed sloth	?	0.22
Squirrel	12	?
Grizzly bear	?	44



Three-toed sloth

- a. Copy and complete the table.
 b. *Compare* the speeds of the fastest and slowest animals in the table.
62. **CHALLENGE** A newspaper gives the exchange rates of some currencies with the U.S. dollar, as shown below. Copy and complete the statements.

	1 USD	in USD
Australian dollar	1.31234	0.761998
Canadian dollar	1.1981	0.834655
Hong Kong dollar	7.7718	0.12867
New Zealand dollar	1.43926	0.694801
Singapore dollar	1.6534	0.604814

This row indicates that
 $\$1$ U.S. \approx $\$1.31$ Australian and
 $\$1$ Australian \approx $\$.76$ U.S.

- a. 1 Singapore dollar \approx ? Canadian dollar(s)
 b. 1 Hong Kong dollar \approx ? New Zealand dollar(s)

MIXED REVIEW

PREVIEW
 Prepare for
 Lesson 1.2
 in Exs. 63–74.

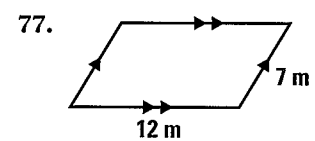
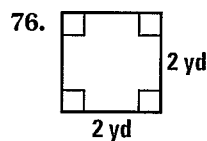
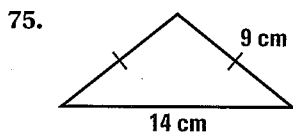
Perform the indicated operation. (p. 975)

63. $3 - 11$ 64. $-4(-8)$ 65. $45 \div (-9)$
 66. $-6 + 13$ 67. $-3(7)$ 68. $5 - (-2)$

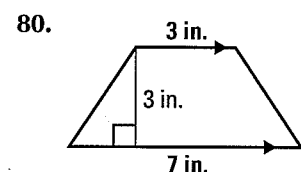
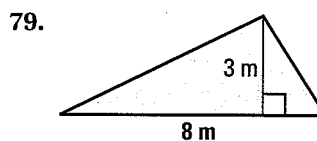
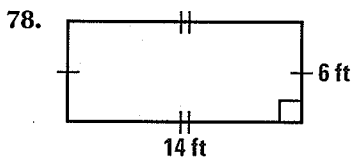
Write the phrase as an algebraic expression. (p. 984)

69. 9 more than a number 70. 5 less than a number 71. 75% of a number
 72. 7 times a number 73. Half of a number 74. The square of a number

Find the perimeter of the figure. (p. 991)



Find the area of the figure. (p. 991)



EXAMPLE 5 Simplify a mathematical model



DIGITAL PHOTO PRINTING You send 15 digital images to a printing service that charges \$.80 per print in large format and \$.20 per print in small format. Write and simplify an expression that represents the total cost if n of the 15 prints are in large format. Then find the total cost if 5 of the 15 prints are in large format.

Solution

Write a verbal model. Then write an algebraic expression.

Price of large print (dollars/print)	•	Number of large prints (prints)	+	Price of small print (dollars/print)	•	Number of small prints (prints)
↓		↓		↓		↓
0.8	•	n	+	0.2	•	$(15 - n)$

An expression for the total cost is $0.8n + 0.2(15 - n)$.

$$\begin{aligned}
 0.8n + 0.2(15 - n) &= 0.8n + 3 - 0.2n && \text{Distributive property} \\
 &= (0.8n - 0.2n) + 3 && \text{Group like terms.} \\
 &= 0.6n + 3 && \text{Combine like terms.}
 \end{aligned}$$

▶ When $n = 5$, the total cost is $0.6(5) + 3 = 3 + 3 = \$6$.

INTERPRET EXPRESSIONS

The total number of prints is 15, so if n are in large format, then $15 - n$ are in small format.

✓ **GUIDED PRACTICE** for Example 5

15. **WHAT IF?** In Example 5, write and simplify an expression for the total cost if the price of a large print is \$.75 and the price of a small print is \$.25.

1.2 EXERCISES

HOMEWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS1 for Exs. 21, 29, and 59
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 24, 33, 51, and 59
- ◆ = MULTIPLE REPRESENTATIONS Ex. 61

SKILL PRACTICE

1. **VOCABULARY** Copy 12^7 and label the base and the exponent.
2. ★ **WRITING** Explain what it means for terms to be like terms.
3. **ERROR ANALYSIS** Describe and correct the error in evaluating the power shown at the right.

$$-3^4 = 81 \quad \times$$

EXAMPLE 1

on p. 10
for Exs. 4–15

EVALUATING POWERS Evaluate the power.

- | | | | |
|--------------|--------------|--------------|--------------|
| 4. 2^3 | 5. 3^4 | 6. 4^3 | 7. 7^2 |
| 8. -5^2 | 9. -2^5 | 10. -8^3 | 11. -10^4 |
| 12. $(-3)^2$ | 13. $(-4)^3$ | 14. $(-2)^8$ | 15. $(-8)^2$ |

EXAMPLE 2

on p. 11
for Exs. 16–24

ORDER OF OPERATIONS Evaluate the expression for the given value of the variable.

16. $5d - 6$ when $d = 7$

17. $-10f + 15$ when $f = 2$

18. $6h \div 2 + h$ when $h = 4$


19. $5j - 3j \cdot 5$ when $j = 10$

20. $(k + 2)^2 - 6k$ when $k = 5$

21. $8m + (2m - 9)^3$ when $m = 6$

22. $n^3 - 4n + 10$ when $n = -3$

23. $2x^4 - 4x^3$ when $x = -1$

 at classzone.com

24. **★ MULTIPLE CHOICE** What is the value of $2x^2 - 6x + 15$ when $x = -2$?

Ⓐ 11

Ⓑ 19

Ⓒ 35

Ⓓ 43

EXAMPLE 4

on p. 12
for Exs. 25–33

SIMPLIFYING EXPRESSIONS Simplify the expression.

25. $9x - 4x + 5$

26. $y^2 + 2y + 3y^2$

27. $5z^2 - 2z + 8z^2 + 10$

28. $10w^2 - 4w + 3w^2 + 18w$

29. $7(m - 3) + 4(m + 5)$


30. $10(n^2 + n) - 6(n^2 - 2)$

31. $4p^2 - 12p - 9p^2 + 3(4p + 7)$

32. $6(q - 2) - 2(q^2 + 6q)$

33. **★ MULTIPLE CHOICE** Which terms are like terms?

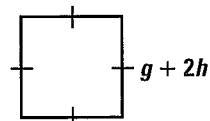
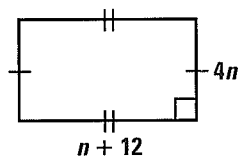
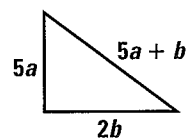
Ⓐ $2x, 2y$ Ⓑ $3x^2, 4x$ Ⓒ x^2, y^2 Ⓓ $10x^3, 2x^3$

 **GEOMETRY** Write a simplified expression for the perimeter of the figure. Then evaluate the expression for the given value(s) of the variable(s).

34. $a = 3, b = 10$

35. $n = 2$

36. $g = 5, h = 4$



EVALUATING EXPRESSIONS Evaluate the expression for the given values of x and y .

37. $5x + 6y$ when $x = 16$ and $y = -9$

38. $16x + 11y$ when $x = -2$ and $y = -3$

39. $x^3 + 5y$ when $x = 4$ and $y = -3$

40. $(3x)^2 - y^3$ when $x = 4$ and $y = 5$

41. $\frac{x - y}{x + y}$ when $x = 10$ and $y = 8$

42. $\frac{x + 2y}{4x - y}$ when $x = -3$ and $y = 4$

HINT

Fraction bars are grouping symbols.

SIMPLIFYING EXPRESSIONS Simplify the expression.

43. $16c - 10d + 3d - 5c$

44. $9j + 4k - 2j - 7k$

45. $2m^2 - 5n^2 + 6n^2 - 8m$

46. $p^3 + 3q^2 - q + 3p^3$

47. $10m^2 + 3n - 8 + 3m^2 - 3n + 3$

48. $3y^2 + 5x - 12x + 9y^2 - 5$

49. $8(s - t) + 16(t - s)$

50. $3(x^2 - y) + 9(x^2 + 2y)$

51. **★ OPEN-ENDED MATH** Write an algebraic expression that includes three coefficients, two like terms, and one constant term. Then simplify the expression.

GROUPING SYMBOLS Add parentheses to make a true statement.

52. $9 + 12 \div 3 - 1 = 15$

53. $4 + 3 \cdot 5 - 2 = 21$

54. $8 + 5^2 - 6 \div 3 = 9$

55. $3 \cdot 4^2 - 2^3 + 3^2 = 23$

56. **CHALLENGE** Under what conditions are the expressions $(x + y)^2$ and $x^2 + y^2$ equal? Are the expressions equivalent? *Explain.*


PROBLEM SOLVING

EXAMPLE 3
on p. 11
for Exs. 57–59

57. **MOVIE COSTS** In the United States, the average movie ticket price (in dollars) since 1974 can be modeled by $0.131x + 1.89$ where x is the number of years since 1974. What values of x should you use to find the ticket prices in 1974, 1984, 1994, and 2004? Find the ticket prices for those years.

 **@HomeTutor** for problem solving help at classzone.com

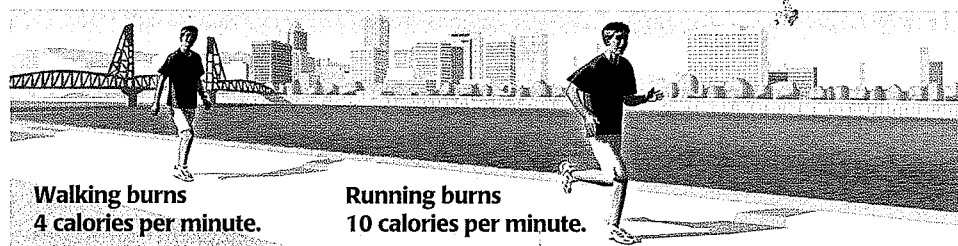
58. **MILEAGE** You start driving a used car when the odometer reads 96,882. After a typical month of driving, the reading is 97,057. Write an expression for the reading on the odometer after m months, assuming the amount you drive each month is the same. Predict the reading after 12 months.

 **@HomeTutor** for problem solving help at classzone.com

59. **★ SHORT RESPONSE** A student has a debit card with a prepaid amount of \$270 to use for school lunches. The cafeteria charges \$4.50 per lunch. Write an expression for the balance on the card after buying x lunches. Does your expression make sense for all positive integer values of x ? *Explain.*

EXAMPLE 5
on p. 13
for Exs. 60–62

60. **CROSS-TRAINING** You exercise for 60 minutes, spending w minutes walking and the rest of the time running. Use the information in the diagram below to write and simplify an expression for the number of calories burned. Find the calories burned if you spend 20 minutes walking.



61. **◆ MULTIPLE REPRESENTATIONS** A theater has 30 rows of seats with 20 seats in each row. Tickets for the seats in the n rows closest to the stage cost \$45 and tickets for the other rows cost \$35.

- a. **Visual Thinking** Make a sketch of the theater seating.
- b. **Modeling** Write a verbal model for the income if all seats are sold.
- c. **Simplifying** Write and simplify an expression for the income.
- d. **Making a Table** Make a table for the income when $n = 5, 10,$ and $15.$

62. **COMPUTERS** A company offers each of its 80 workers either a desktop computer that costs \$900 or a laptop that costs \$1550. Write and simplify an expression for the cost of all the computers when n workers choose desktop computers. Find the cost if 65 workers choose desktop computers.

63. **CHALLENGE** You want to buy 25 fish for an aquarium. You decide to buy danios, tetras, and rainbowfish.



danios
\$1.50 each



tetras
\$2.00 each



rainbowfish
\$8.00 each

Write and simplify an expression for the total cost of x danios, y tetras, and the rest rainbowfish. You buy 8 danios, 10 tetras, and the rest rainbowfish. What is the total cost?

MIXED REVIEW

PREVIEW

Prepare for
Lesson 1.3
in Exs. 64–67.

Find the least common denominator (LCD) of the fractions. (p. 979)

64. $\frac{1}{2}, \frac{4}{5}, \frac{3}{10}$

65. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$

66. $\frac{3}{4}, \frac{1}{6}, \frac{7}{8}$

67. $\frac{2}{9}, \frac{1}{4}, \frac{5}{6}$

Identify the property that the statement illustrates. (p. 2)

68. $(7 \cdot 8) \cdot 25 = 7 \cdot (8 \cdot 25)$

69. $\frac{3}{7} \cdot \frac{7}{3} = 1$

Perform the indicated conversion. (p. 2)

70. 15 meters to centimeters

71. 5000 pounds to tons

72. 100 yards to inches

73. 20 days to minutes

QUIZ for Lessons 1.1–1.2

Graph the numbers on a number line. (p. 2)

1. $-5, \frac{7}{2}, 1, -\frac{4}{3}$

2. $-6.2, 5.4, \sqrt{5}, -2.5$

3. $0, -7.3, -\frac{2}{5}, 2\sqrt{3}$

Identify the property that the statement illustrates. (p. 2)

4. $6(4 + 9) = 6(4) + 6(9)$

5. $-5 \cdot 8 = 8 \cdot (-5)$

6. $17 + (-17) = 0$

Evaluate the expression for the given value of the variable. (p. 10)

7. $10m + 32$ when $m = -5$

8. $12 + (8 - n)^3$ when $n = 5$

9. $p^3 - 3p^2$ when $p = -2$

Simplify the expression. (p. 10)

10. $8x + 6x^2 - 9x^2 - 4x$

11. $5(x + 9) - 2(4 - x)$

12. $24x - 6y + 15y - 18x$

13. **CD COSTS** CDs are on sale for \$8 each and you have a gift card worth \$100. Write an expression for the amount of money left on the gift card after purchasing n CDs. Evaluate the expression to find the amount of money left after purchasing 6 CDs. (p. 10)

1.2 Evaluate Expressions

QUESTION How can you use a calculator to evaluate expressions?

You can use a scientific calculator or a graphing calculator to evaluate expressions. Keystrokes for evaluating several expressions are shown below.

Note that to enter a negative number, you use the \pm/\mp key on a scientific calculator or the $(-)$ key (not the $=$ key) on a graphing calculator.

EXAMPLE Evaluate expressions

EXPRESSION	CALCULATOR	KEYSTROKES	RESULT
a. $-4^2 + 6$	Scientific	4 \times^2 \pm/\mp + 6 =	-10
$-4^2 + 6$	Graphing	$(-)$ 4 \times^2 + 6 ENTER	-10
b. $(-4)^2 + 6$	Scientific	4 \pm/\mp \times^2 + 6 =	22
$(-4)^2 + 6$	Graphing	($(-)$ 4) \times^2 + 6 ENTER	22
c. $(39 \div 3)^3$	Scientific	(39 \div 3) y^x 3 =	2197
$(39 \div 3)^3$	Graphing	(39 \div 3) ^ 3 ENTER	2197
d. $\frac{64 - 5 \cdot 8}{4}$	Scientific	(64 - 5 \times 8) \div 4 =	6
$\frac{64 - 5 \cdot 8}{4}$	Graphing	(64 - 5 \times 8) \div 4 ENTER	6

PRACTICE

Use a calculator to evaluate the expression.

- $50.2 - 15 \div 3$
- $-11(20) - 66$
- $21(-8) + 51$
- $(-4)^4$
- $7(44.5 - 8^2)$
- $\frac{9.2 - 15.9}{-19 + 14}$

Use a calculator to evaluate the expression when $x = -3$, $y = 5$, and $z = -6$.

- $7z + y$
- x^6
- $6y - z^3$
- $\frac{10x}{2z - 3}$
- $(x + y)^2 + 3z$
- $(-4x + 9) \div (y + 2)$

13. **ERROR ANALYSIS** A student evaluated the expression $7 + (-4)^3$ on a graphing calculator by pressing 7 $+$ ($-$ 4) ^ 3 ENTER. The calculator displayed an error message. Describe and correct the error.



GUIDED PRACTICE for Examples 3, 4, and 5

Solve the equation. Check your solution.

5. $-2x + 9 = 2x - 7$

6. $10 - x = -6x + 15$

7. $3(x + 2) = 5(x + 4)$

8. $-4(2x + 5) = 2(-x - 9) - 4x$

9. $\frac{1}{4}x + \frac{2}{5}x = 39$

10. $\frac{2}{3}x + \frac{5}{6} = x - \frac{1}{2}$

11. **WHAT IF?** In Example 5, suppose it takes you 9 minutes to wash a car and it takes your friend 12 minutes to wash a car. How long does it take the two of you to wash 7 cars if you work together?

1.3 EXERCISES

HOMEWORK KEY

○ = WORKED-OUT SOLUTIONS on p. WS1 for Exs. 23, 43, and 71

★ = STANDARDIZED TEST PRACTICE Exs. 2, 19, 32, 72, and 77

◆ = MULTIPLE REPRESENTATIONS Ex. 74

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: If a number is substituted for a variable in an equation and the resulting statement is true, the number is called a(n) ? of the equation.

2. **★ WRITING** Give an example of two equivalent equations. How do you know they are equivalent?

EXAMPLE 1

on p. 18
for Exs. 3–19

VARIABLE ON ONE SIDE Solve the equation. Check your solution.

3. $x + 8 = 11$

4. $y - 4 = 7$

5. $z - 13 = -1$

6. $-3 = w + 5$

7. $5d = 30$

8. $4 = \frac{2}{5}g$

9. $\frac{9}{2}h = -1$

10. $-16k = -8$

11. $6m - 3 = 21$

12. $4n - 10 = 12$

13. $3 = 2p + 5$

14. $-3q + 4 = 13$

15. $1 = \frac{1}{3}a - 5$

16. $\frac{3}{11}b + 5 = 5$

17. $7 - \frac{5}{3}c = 22$

18. $3 + \frac{8}{7}d = -1$

19. **★ MULTIPLE CHOICE** What is the solution of $4x - 7 = -15$?

(A) -12

(B) -2

(C) 2

(D) $\frac{11}{2}$

EXAMPLE 3

on p. 19
for Exs. 20–32

VARIABLE ON BOTH SIDES Solve the equation. Check your solution.

20. $3a + 4 = 2a + 15$

21. $5w + 2 = 2w + 5$

22. $6x + 7 = 2x + 59$

23. $5b - 4 = 2b + 8$

24. $3y + 7 = y - 3$

25. $2z - 3 = 6z + 25$

26. $4n - 7 = 5 - 2n$

27. $2c + 14 = 6 - 4c$

28. $5m - 2 = -m - 2$

29. $p + 5 = 25 - 4p$

30. $6 - 5q = q + 9$

31. $17 - 6r = 25 - 3r$

32. **★ MULTIPLE CHOICE** What is the solution of $7t - 5 = 3t + 11$?

(A) $-\frac{3}{2}$

(B) $\frac{3}{2}$

(C) $\frac{8}{5}$

(D) 4

EXAMPLE 4
 on p. 20
 for Exs. 33–40

THE DISTRIBUTIVE PROPERTY Solve the equation. Check your solution.

33. $2(b + 3) = 4b - 2$

34. $5d + 17 = 4(d + 3)$

35. $3(m - 5) = 6(m + 1)$

36. $-4(n + 2) = 3(n - 4)$

37. $12(r + 3) = 2(r + 5) - 3r$

38. $7(t - 3) = 2(t - 9) + 2t$

39. $10(w - 4) = 4(w + 4) + 4w$

40. $3(2x - 5) - x = -7(x + 3)$

ERROR ANALYSIS Describe and correct the error in solving the equation.

41.

$$\frac{3}{7}x + 2 = 17$$

$$\frac{3}{7}x = 15$$

$$x = 15 - \frac{3}{7}$$

$$x = 14\frac{4}{7}$$

42.

$$\frac{1}{5}x + \frac{1}{2} = 1$$

$$10\left(\frac{1}{5}x + \frac{1}{2}\right) = 1$$

$$2x + 5 = 1$$

$$x = -2$$

EXAMPLE 5
 on p. 20
 for Exs. 43–50

EQUATIONS WITH FRACTIONS Solve the equation. Check your solution.

43. $\frac{1}{2}t + \frac{1}{3}t = 10$

44. $\frac{1}{5}d + \frac{1}{8}d = 2$

45. $\frac{2}{3}m - \frac{3}{5}m = 4$

46. $\frac{4}{7}z + \frac{2}{3}z = 13$

47. $\frac{3}{7}w - \frac{2}{9} = \frac{4}{9}w + \frac{1}{7}$

48. $\frac{1}{2}x + 4 = -\frac{2}{3}x + \frac{1}{2}$

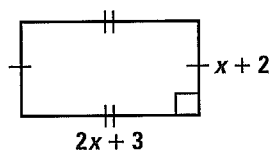
49. $\frac{2}{5}k + \frac{1}{6} = \frac{3}{10}k + \frac{1}{3}$

50. $\frac{2}{3}q - \frac{1}{12} = q + \frac{1}{8}$

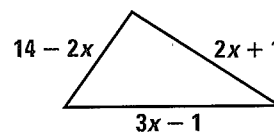
Animated Algebra at classzone.com

GEOMETRY Solve for x . Then find the length of each side of the figure.

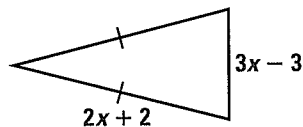
51. Perimeter = 46



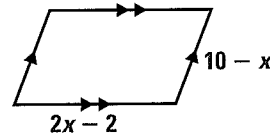
52. Perimeter = 26



53. Perimeter = 15



54. Perimeter = 26



EQUATIONS WITH DECIMALS Solve the equation. Check your solution.

55. $0.6g + 0.5 = 2.9$

56. $1.1h + 1.3 = 6.8$

57. $0.4k - 0.6 = 1.3k + 1.2$

58. $6.5m + 1.5 = 4.3m - 0.7$

59. $3.8w + 3.2 = 2.3(w + 4)$

60. $1.7(x + 5) = 2.1x + 9.7$

61. $2.25b + 3.81 = 1.75b + 5.26$

62. $18.13 - 5.18c = 6.32c - 8.32$

SPECIAL EQUATIONS Solve the equation. If there is no solution, write *no solution*. If the equation is always true, write *all real numbers*.

63. $5(x - 4) = 5x + 12$

64. $3(x + 5) = 3x + 15$

65. $5(2 - x) = 3 - 2x + 7 - 3x$

66. $-2(4 - 3x) + 7 = 6(x + 1)$

67. **CHALLENGE** Solve the equation $ax + b = cx + d$ for x in terms of a , b , c , and d . Under what conditions is there no solution? Under what conditions are all real numbers solutions?

PROBLEM SOLVING

EXAMPLE 2
on p. 19
for Exs. 68–71

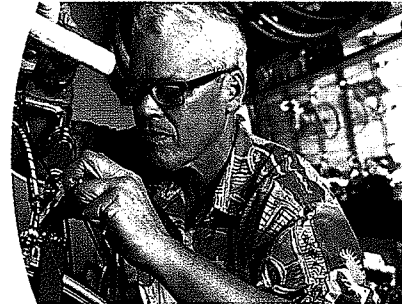
68. **CATALOG PURCHASE** You are ordering T-shirts from a catalog. Each T-shirt costs \$15. The cost of shipping is \$6 no matter how many you order. The total cost is \$111. How many T-shirts did you order?

@HomeTutor for problem solving help at classzone.com

69. **BICYCLE REPAIR** The bill for the repair of your bicycle was \$180. The cost of parts was \$105. The cost of labor was \$25 per hour. How many hours did the repair work take?

@HomeTutor for problem solving help at classzone.com

70. **CAR SALES** A salesperson at a car dealership has a base salary of \$25,000 per year and earns a 5% commission on total sales. How much must the salesperson sell to earn \$50,000 in one year?



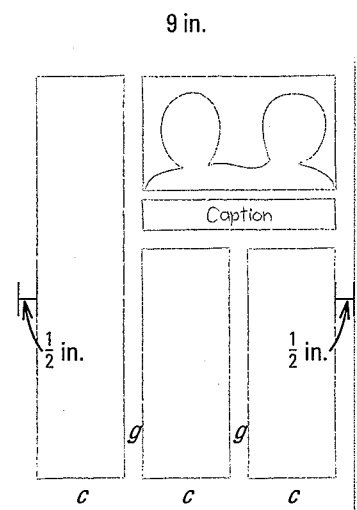
71. **SUMMER JOBS** You have two summer jobs. In the first job, you work 25 hours per week and earn \$7.75 per hour. In the second job, you earn \$6.25 per hour and can work as many hours as you want. You want to earn \$250 per week. How many hours must you work at the second job?

72. **★ SHORT RESPONSE** Your friend bought a total of 10 CDs and DVDs as gifts for \$199. The price per CD was \$15 and the price per DVD was \$22. Write and solve an equation to find how many CDs and how many DVDs your friend bought. How would your answer change if the total cost of the CDs and DVDs was \$185? *Explain.*

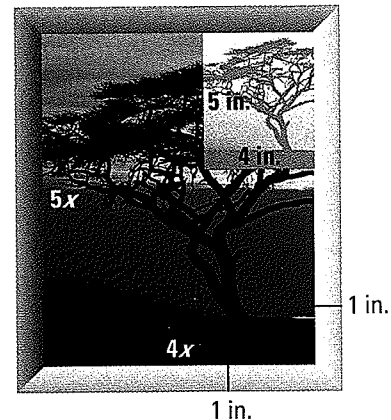
73. **MULTI-STEP PROBLEM** You are working on the layout of a yearbook. The page is 9 inches wide, has $\frac{1}{2}$ inch margins, and has three columns of equal width.

- Write and simplify an equation that relates the column width c and the gap g between columns to the total width of the page.
- Copy and complete the table by substituting the given value into your equation from part (a) and solving to find the unknown value.

Gap, g (in.)	$\frac{5}{8}$?	$\frac{3}{8}$?
Column width, c (in.)	?	$2\frac{1}{3}$?	$2\frac{1}{2}$



74. **MULTIPLE REPRESENTATIONS** You want to enlarge a 4 inch by 5 inch photo to fit into a 1 inch wide frame that has an outer perimeter of 53 inches.
- Using a Diagram** Write an expression for the outer perimeter of the picture frame.
 - Making a Table** Evaluate the perimeter expression when $x = 1.5, 2, 2.5, 3,$ and 3.5 . Make a table of your results. For what value of x is the perimeter 53 inches?
 - Using an Equation** Write and solve an equation to find x . *Explain* what the value of x tells you about how much you should enlarge the original photo.



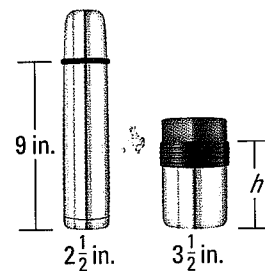
EXAMPLE 5
on p. 20
for Exs. 75–77

75. **RAKING LEAVES** It takes you 30 minutes to rake the leaves in your yard and it takes your brother 45 minutes. How long does it take the two of you to rake the leaves when working together?
76. **MURAL PAINTING** You paint 2 square yards of a community mural in 3 hours and a friend paints 4 square yards in 5 hours. How long does it take the two of you to paint 11 square yards when working together?

 at classzone.com

77. **MULTIPLE CHOICE** Three students use calligraphy pens to write the names of graduating seniors on their diplomas. One writes 7 names in 6 minutes, another writes 17 names in 10 minutes, and the third writes 23 names in 15 minutes. How long, to the nearest minute, will the students take to write names on 440 diplomas if they work together?
- (A) 97 minutes (B) 100 minutes (C) 103 minutes (D) 290 minutes

78. **CHALLENGE** A cylindrical thermos with an inside diameter of $2\frac{1}{2}$ inches is filled with liquid to a height of 9 inches. If the liquid is poured into a cylindrical travel mug with an inside diameter of $3\frac{1}{2}$ inches, what will be the height h of the liquid?



MIXED REVIEW

PREVIEW
Prepare for
Lesson 1.4
in Exs. 79–82.

Find the area of the figure. (p. 991)

79. Square with sides of length 10 m 80. 4 in. by 6 in. rectangle
81. Circle with a radius of 3 in. 82. Circle with a diameter of 15 cm

Identify the property that the statement illustrates. (p. 2)

83. $(10 \cdot 13) \cdot 2 = 10 \cdot (13 \cdot 2)$ 84. $-23 + 23 = 0$
85. $6 + (5 + 4) = 6 + (4 + 5)$ 86. $4(1 + 0.25) = 4(1) + 4(0.25)$

Simplify the expression. (p. 10)

87. $7x^2 + 8 - 3x - 5x^2$ 88. $5y - 3y^3 + 7y - y^2$
89. $2(z - 5) + 9(z + 2)$ 90. $-5(w + 3) - (w + 2)$

1.3 Use Tables to Solve Equations

QUESTION How can you use tables to solve linear equations?

You can use the *table* feature of a graphing calculator to solve linear equations.

EXAMPLE Solve a linear equation

Use the *table* feature of a graphing calculator to solve the equation $3x + 8 = 9x - 16$.

STEP 1 Enter expressions

Press $\boxed{Y=}$. Enter the left side of the equation as $y_1 = 3x + 8$. Enter the right side of the equation as $y_2 = 9x - 16$.

Y1=	3X+8
Y2=	9X-16
Y3=	
Y4=	
Y5=	
Y6=	
Y7=	

STEP 2 Make a table

Press $\boxed{2nd}$ [TBLSET]. Set the starting x -value TblStart to 0 and the step value ΔTbl (the value by which the x -values increase) to 1.

TABLE SETUP	
TblStart=	0
ΔTbl=	1
Indpnt:	Auto Ask
Depend:	Auto Ask

STEP 3 Identify solution

Press $\boxed{2nd}$ [TABLE] to display the table. Scroll through the table until you find an x -value for which both sides of the equation have the same value.

X	Y1	Y2
0	8	-16
1	11	-7
2	14	2
3	17	11
4	20	20
5	23	29

X=4

Both sides of the equation have a value of 20 when $x = 4$. So, the solution of $3x + 8 = 9x - 16$ is 4.

PRACTICE

Use the *table* feature of a graphing calculator to solve the equation.

- $7x - 3 = -x + 13$
- $-6x + 8 = 12 - 5x$
- $-2x - 13 = -3x - 5$
- $22 + 15x = -9x - 2$
- $4x + 27 = -8 + 11x$
- $7 - 8x = -9 - 10x$
- REASONING** Consider the equation $4x + 18 = 9x - 9$.
 - Attempt to solve the equation using the *table* feature of a graphing calculator with step value $\Delta Tbl = 1$. Between what two integers does the solution lie? How do you know?
 - Use a smaller value of ΔTbl to find the exact solution.
- WRITING** Solve the equation $3x + 8 = 9x - 16$ by writing it in the form $ax + b = 0$, entering $y_1 = ax + b$ on a graphing calculator, and using a table to find the x -value for which $y_1 = 0$. What are the advantages and disadvantages of this method compared to the method shown above?

1.4 EXERCISES

HOMEWORK KEY

○ = WORKED-OUT SOLUTIONS
on p. WS1 for Exs. 3, 9, and 35

★ = STANDARDIZED TEST PRACTICE
Exs. 2, 6, 15, 27, 36, and 38

SKILL PRACTICE

EXAMPLES

1 and 2

on pp. 26–27
for Exs. 3–6

1. **VOCABULARY** Copy and complete: A(n) ? is an equation that relates two or more quantities.

2. ★ **WRITING** What does it mean to solve for a variable in an equation?

REWRITING FORMULAS Solve the formula for the indicated variable. Then use the given information to find the value of the variable.

3. Solve $A = lw$ for l . Then find the length of a rectangle with a width of 50 millimeters and an area of 250 square millimeters.

4. Solve $A = \frac{1}{2}bh$ for b . Then find the base of a triangle with a height of 6 inches and an area of 24 square inches.

5. Solve $A = \frac{1}{2}(b_1 + b_2)h$ for h . Then find the height of a trapezoid with bases of lengths 10 centimeters and 15 centimeters and an area of 75 square centimeters.

6. ★ **MULTIPLE CHOICE** What equation do you obtain when you solve the formula $A = \frac{1}{2}(b_1 + b_2)h$ for b_1 ?

(A) $b_1 = \frac{2A}{h} - b_2$

(B) $b_1 = \frac{A}{2h} - b_2$

(C) $b_1 = 2A - b_2h$

(D) $b_1 = \frac{2A}{h - b_2}$

EXAMPLE 3

on p. 28
for Exs. 7–17

REWRITING EQUATIONS Solve the equation for y . Then find the value of y for the given value of x .

7. $3x + y = 26; x = 7$

8. $4y + x = 24; x = 8$

9. $6x + 5y = 31; x = -4$

10. $15x + 4y = 9; x = -3$

11. $9x - 6y = 63; x = 5$

12. $10x - 18y = 84; x = 6$

13. $8y - 14x = -22; x = 5$

14. $9y - 4x = -30; x = 8$

15. ★ **MULTIPLE CHOICE** What equation do you obtain when you solve the equation $4x - 5y = 20$ for y ?

(A) $x = \frac{5}{4}y + 5$

(B) $y = -\frac{4}{5}x + 4$

(C) $y = \frac{4}{5}x - 4$

(D) $y = \frac{4}{5}x - 20$

ERROR ANALYSIS Describe and correct the error in solving the equation for y .

16.

$$-7x + 5y = 2$$

$$5y = 7x + 2$$

$$y = \frac{7}{5}x + 2$$



17.

$$4y - xy = 9$$

$$4y = 9 + xy$$

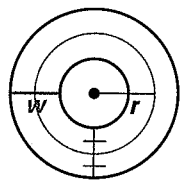
$$y = \frac{9 + xy}{4}$$



GEOMETRY Solve the formula for the variable in red. Then use the given information to find the value of the variable. Round to the nearest tenth.

18. Area of a circular ring

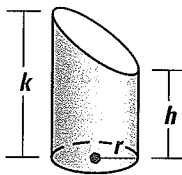
$$A = 2\pi r w$$



Find r if $w = 4$ ft and $A = 120$ ft².

19. Lateral surface area of a truncated cylinder

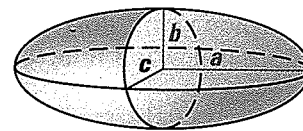
$$S = \pi r(h + k)$$



Find h if $r = 2$ cm, $k = 3$ cm, and $S = 50$ cm².

20. Volume of an ellipsoid

$$V = \frac{4}{3}\pi abc$$



Find c if $a = 4$ in., $b = 3$ in., and $V = 60$ in.³

EXAMPLE 4
on p. 28
for Exs. 21–26

REWRITING EQUATIONS Solve the equation for y . Then find the value of y for the given value of x .

21. $xy - 3x = 40$; $x = 5$

22. $7x - xy = -18$; $x = -4$

23. $3xy - 28 = 16x$; $x = 4$

24. $9y + 6xy = 30$; $x = -6$

25. $y - 2xy = 15$; $x = -1$

26. $4x + 7y + 5xy = 0$; $x = 1$

27. **★ SHORT RESPONSE** Consider the equation $15x - 9y = 27$. To find the value of y when $x = 2$, you can use two methods.

Method 1 Solve the original equation for y and then substitute 2 for x .

Method 2 Substitute 2 for x and then solve the resulting equation for y .

Show the steps of the two methods. Which method is more efficient if you need to find the value of y for several values of x ? Explain.

REASONING Solve for the indicated variable.

28. Solve $xy = x + y$ for y .

29. Solve $xyz = x + y + z$ for z .

30. Solve $\frac{1}{x} + \frac{1}{y} = 1$ for y .

31. Solve $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ for z .

32. **CHALLENGE** Write a formula giving the area of a circle in terms of its circumference.

PROBLEM SOLVING

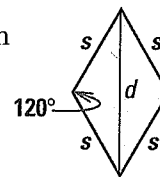
EXAMPLE 5
on p. 29
for Exs. 33–38

33. **TREE DIAMETER** You can estimate the diameter of a tree without boring through it by measuring its circumference. Solve the formula $C = \pi d$ for d . Then find the diameter of an oak that has a circumference of 113 inches.

@HomeTutor for problem solving help at classzone.com

34. **DESIGN** The fabric panels on a kite are rhombuses. For the panel shown, a formula for the length of the long diagonal d is $d = s\sqrt{3}$ where s is the length of a side. Solve the formula for s . Then find the value of s when $d = 15$ inches.

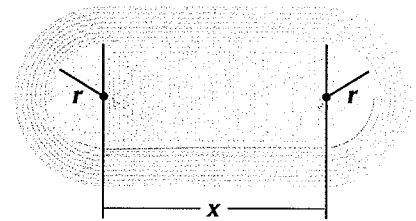
@HomeTutor for problem solving help at classzone.com



35. **TEMPERATURE** The formula for converting temperatures from degrees Celsius to degrees Fahrenheit is $F = \frac{9}{5}C + 32$. Solve the formula for C . Then find the temperature in degrees Celsius that corresponds to 50°F .

36. **★ EXTENDED RESPONSE** A quarter mile running track is shaped as shown. The formula for the inside perimeter is $P = 2\pi r + 2x$.

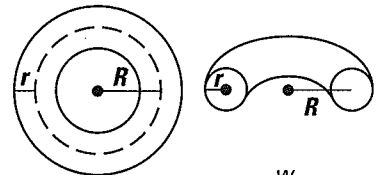
- Solve the perimeter formula for r .
- For a quarter mile track, $P = 440$ yards. Find r when $x = 75$ yards, 100 yards, 120 yards, and 150 yards.
- What are the greatest and least possible values of r if $P = 440$ yards? *Explain* how you found the values, and sketch the track corresponding to each extreme value.



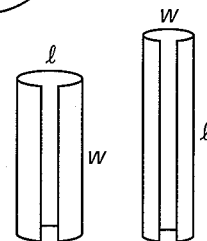
37. **MULTI-STEP PROBLEM** A tuxedo shop rents classic tuxedos for \$80 and designer tuxedos for \$150. Write an equation that represents the shop's revenue. Solve the equation for the variable representing the number of designer tuxedos rented. The shop owner wants \$60,000 in revenue during prom season. How many designer tuxedos must be rented if the number of classic tuxedos rented is 600? 450? 300?

38. **★ OPEN-ENDED MATH** The volume of a donut-like shape called a *torus* is given by the formula $V = 2\pi^2 r^2 R$ where r and R are the radii shown and $r \leq R$.

- Solve the formula for R .
- A metal ring in the shape of a torus has a volume of 100 cubic centimeters. Choose three possible values of r , and find the corresponding values of R .



39. **CHALLENGE** A rectangular piece of paper with length ℓ and width w can be rolled to form the lateral surface of a cylinder in two ways, assuming no overlapping. Write a formula for the volume of each cylinder in terms of ℓ and w .



MIXED REVIEW

PREVIEW

Prepare for
Lesson 1.5
in Exs. 40–47.

Write an expression to answer the question. (p. 984)

- You have \$250 in a bank account and deposit x dollars. What is your current balance?
- You buy x CDs for \$12.99 each. How much do you spend?

Evaluate the expression for the given value of the variable. (p. 10)

- $6j + 8$ when $j = -3$
- $6 + 4k \div 2$ when $k = 3$
- $8g - 8g \cdot 2$ when $g = -1$
- $-5m^3 + m^2$ when $m = 10$
- $(n + 7)^2 - 4$ when $n = 2$
- $(3p - 17)^3$ when $p = 5$

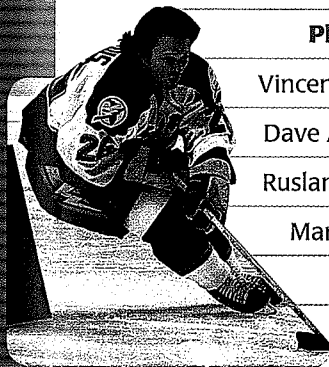
Solve the equation. Check your solution. (p. 18)

- $4x + 7 = 10x + 25$
- $15 - 2y = 2y - 45$
- $56 = 4(4 + 2z)$
- $9(p + 3) = 35p + 1$
- $\frac{5}{3}q - 9 = 1$
- $\frac{1}{4}r + \frac{1}{6}r = 5$



Lessons 1.1–1.4

- MULTI-STEP PROBLEM** There is a \$50 annual membership fee to join an urban car rental service. Using a car costs \$8.50 per hour.
 - Write a verbal model for this situation. Then use the verbal model to write an algebraic expression.
 - How much will it cost to join the service and drive for 20 hours?
- MULTI-STEP PROBLEM** You are attending a museum. You have \$50 to spend. Admission to the museum is \$15. Admission to each special exhibit inside the museum is \$10.
 - Write an equation that can be used to find the number of special exhibits you can include in your visit.
 - Solve the equation. Interpret your answer in terms of the problem.
- SHORT RESPONSE** In hockey, each player has a statistic called plus/minus, which is the difference between the number of goals scored by the player's team and the number of goals scored by the other team when the player is on the ice. List the players shown in order from least to greatest plus/minus. Whose plus/minus score is best? *Explain.*



Player	Plus/Minus
Vincent Lecavalier	23
Dave Andreychuk	-9
Ruslan Fedotenko	14
Martin St. Louis	35
Cory Sarich	5
Tim Taylor	-5

- SHORT RESPONSE** You are in charge of buying food for a school picnic. You have \$45 to spend on ground beef and chicken. Ground beef costs \$1.80 per pound and chicken costs \$1.00 per pound. Write an equation representing the situation. You want to buy equal amounts of ground beef and chicken. How much of each can you buy? Show how you found your answer.

- GRIDDED ANSWER** You drive from Chicago to St. Louis, a distance of 290 miles. Your average speed is 60 miles per hour. How many hours does the trip take? Round your answer to the nearest tenth of an hour.
- OPEN-ENDED** Describe a shopping situation that can be modeled by the equation $10x + 29y = 78$.
- EXTENDED RESPONSE** In one year, the Bureau of Engraving and Printing printed \$10 and \$20 bills with a total value of \$66,368,000. The total number of \$10 and \$20 bills was 3,577,600.

	Number	Value
\$10 bills	x	$10x$
\$20 bills	?	?
Total	3,577,600	66,368,000

- Copy and complete the table.
 - Write and solve an equation to find how many \$10 bills and how many \$20 bills were printed.
 - Compare the total value of the \$10 bills printed with the total value of the \$20 bills printed.
- OPEN-ENDED** You have two summer jobs. You mow lawns for \$20 per lawn. You also work at a restaurant for \$7.50 per hour. Write an equation for the total amount of money you earn. Then find three different ways to earn \$300 during one week.
 - GRIDDED ANSWER** The liopleurodon, a swimming dinosaur from the Late Jurassic period, could grow to 25 meters in length. Use the fact that 1 in. = 2.54 cm to convert the length to feet. Round your answer to the nearest foot.
 - GRIDDED ANSWER** The formula for the volume of a cone is $V = \frac{1}{3}Bh$. Find h (in centimeters) if $V = 176 \text{ cm}^3$ and $B = 40 \text{ cm}^2$.

1.5 EXERCISES

HOMEWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS2 for Exs. 3, 11, and 27
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 15, 16, 21, and 27
- ◆ = MULTIPLE REPRESENTATIONS Ex. 28

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: A word equation that represents a real-life problem is called a(n) ? .
2. ★ **WRITING** Give an example of how a problem solving strategy can help you write an equation that models a real-life problem.

EXAMPLE 1
on p. 34
for Exs. 3–10

USING A FORMULA Use the formula $d = rt$ for distance traveled to solve for the missing variable.

3. $d = 20$ mi, $r = 40$ mi/h, $t = ?$
4. $d = 300$ mi, $r = ?$, $t = 4$ h
5. $d = ?$, $r = 30$ mi/h, $t = 3$ h
6. $d = 250$ mi, $r = 50$ mi/h, $t = ?$

GEOMETRY Use the formula $P = 2\ell + 2w$ for the perimeter of a rectangle to solve for the missing variable.

7. $P = ?$, $\ell = 15$ ft, $w = 12$ ft
8. $P = 46$ in., $\ell = ?$, $w = 4$ in.
9. $P = 100$ m, $\ell = 30$ m, $w = ?$
10. $P = 25$ cm, $w = 5$ cm, $\ell = ?$

EXAMPLE 2
on p. 35
for Exs. 11–15

USING PATTERNS Look for a pattern in the table. Then write an equation that represents the table.

11.

x	0	1	2	3
y	11	15	19	23

12.

x	0	1	2	3
y	60	45	30	15

13.

x	0	1	2	3
y	46	36	26	16

14.

x	0	1	2	3
y	57	107	157	207

15. ★ **MULTIPLE CHOICE** Which equation represents the table at the right?

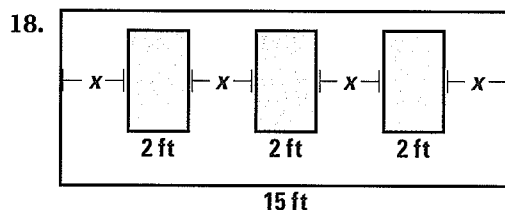
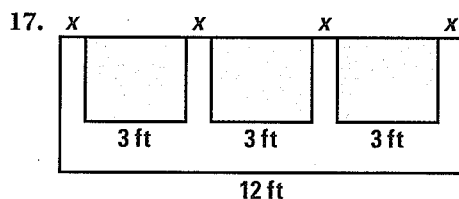
- A $y = 5x + 7$
 B $y = 7x + 5$
 C $y = 12x - 5$
 D $y = 7x + 12$

x	0	1	2	3
y	12	19	26	33

16. ★ **SHORT RESPONSE** The first story of a building is 24 feet high, and each additional story is 18 feet high. Write an expression for the height to the top of the n th story. *Explain* the meaning of each term in the expression.

EXAMPLE 3
on p. 35
for Exs. 17–18

USING DIAGRAMS Write and solve an equation to find x .



ERROR ANALYSIS Describe and correct the error in writing the equation.

19.

x	0	1	2	3
y	75	65	55	45

An equation that represents the table is $y = 75x - 10$.



20.

x	0	5	10	15
y	7	17	27	37

An equation that represents the table is $y = 7 + 10x$.



21. **★ MULTIPLE CHOICE** A car used 15 gallons of gasoline and traveled a total distance of 350 miles. The car's fuel efficiency is 25 miles per gallon on the highway and 20 miles per gallon in the city. Which equation can you solve to find h , the number of gallons that were used on the highway?

(A) $350 = 25(15 - h) + 20h$

(B) $25h + 20(15 - h) = 350$

(C) $350 = \left(\frac{25 + 20}{2}\right)h$

(D) $15 = \frac{350}{25h} + \frac{350}{20h}$

CHALLENGE Write an equation that represents the table.

22.

x	0	3	6	9
y	12	30	48	66

23.

x	4	5	6	7
y	12	19	26	33

PROBLEM SOLVING

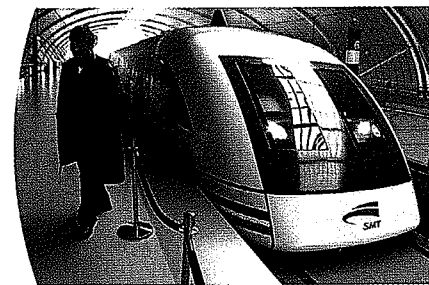
EXAMPLE 1
on p. 34
for Exs. 24–26

24. **DAYTONA 500** A recent Daytona 500 race was won by Dale Earnhardt, Jr. He completed the 500 mile race in 3.2 hours. What was his average racing speed?

for problem solving help at classzone.com

25. **MAGLEV TRAIN** A magnetic levitation (maglev) train travels between the city center of Shanghai, China, and Pudong International Airport. The trip covers 30 kilometers in just 8 minutes. What is the average speed of the train?

for problem solving help at classzone.com



26. **SCUBA DIVING** A scuba diver is returning to the surface from a depth of 165 feet. The safe ascent rate for a diver is 30 feet per minute. How many minutes will it take for the diver to return to the surface?

EXAMPLE 2
on p. 35
for Exs. 27–28

27. **★ SHORT RESPONSE** The table shows the height of a bamboo shoot during a period of fast growth. Use the table to write an equation modeling the growth. Do you think it is reasonable to assume the pattern in the table continues indefinitely? *Explain.*

Day	0	1	2	3	4
Bamboo height (ft)	15	16.5	18	19.5	21

28. **MULTIPLE REPRESENTATIONS** Your cell phone plan costs \$40 per month plus \$.10 per text message. You receive a bill for \$53.80.

- a. **Making a Table** Copy and complete the table below. Use the table to estimate how many text messages you sent.

Text messages	0	50	100	150	200
Monthly bill	\$40	?	?	?	?

- b. **Writing a Model** Write an equation for the situation. Solve it to find exactly how many text messages you sent.
- c. **Comparing Answers** Is your estimate from part (a) compatible with the exact answer from part (b)? *Explain.*

EXAMPLE 3
on p. 35
for Exs. 29–30

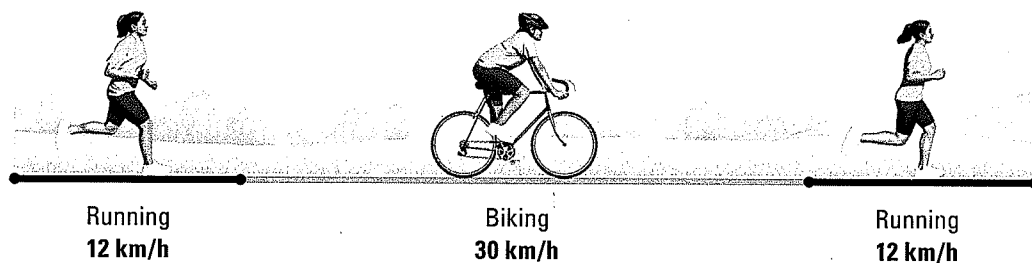
29. **WOOD SHOP** You have a piece of wood that is 72 inches long. You cut the wood into three pieces. The second piece is 6 inches longer than the first piece. The third piece is 6 inches longer than the second piece. Draw a diagram and then write and solve an equation to find the lengths of the three pieces.

30. **POSTERS** You want to tape five posters on a wall so that the spaces between posters are the same. You also want the spaces at the left and right of the group of posters to be three times the space between any two adjacent posters. The wall is 15 feet wide and the posters are 1.5 feet wide. Draw a diagram and then write and solve an equation to find how to position the posters.

EXAMPLE 4
on p. 36
for Exs. 31–32

31. **PACKING WEIGHT** A moving company weighs 20 boxes you have packed that contain either books or clothes and says the total weight is 404 pounds. You know that a box of books weighs 40 pounds and a box of clothes weighs 7 pounds. Write and solve an equation to find how many boxes of books and how many boxes of clothes you packed.

32. **MULTI-STEP PROBLEM** A duathlon consists of a run, a bike ride, and a second run. Use the information below about the average rates of one participant who completed a 55 kilometer duathlon in 2 hours 35 minutes.



- a. **Model** Write a verbal model that shows the race distance as the sum of the total running distance and the biking distance.
- b. **Translate** Write an equation based on the verbal model.
- c. **Solve** Solve the equation to find how much time the participant spent running and how much time the participant spent biking.
- d. **Check** Find the total running distance and the biking distance, and verify that their sum is 55 kilometers.
33. **CHALLENGE** You are hanging fliers around a cylindrical kiosk that has a diameter of 5 feet. You want to hang 15 fliers that are 8.5 inches wide so they are evenly spaced. How far apart should the fliers be placed?

MIXED REVIEW

Write an expression to answer the question. (p. 984)

34. A video rental costs \$2.85 and has a late fee of \$1.00 per day. What is the total cost if you return the video d days late?
35. You want to leave a 20% tip at a restaurant. What is the total amount you should pay if your meal costs x dollars?

Graph the numbers on a number line. (p. 2)

36. $3, \frac{3}{2}, -1, -\frac{4}{3}$ 37. $-\sqrt{5}, 2.5, 9, \sqrt{7}$ 38. $-5, -\frac{9}{2}, \sqrt{17}, 4.5$

Evaluate the expression for the given value of the variable. (p. 10)

39. $3n^4$ when $n = 5$ 40. $-2p^2$ when $p = -3$ 41. $r^2 + r^3$ when $r = -1$
42. $(b + 7)^2 + b^2$ when $b = 2$ 43. $j^3 - 4j$ when $j = -3$ 44. $-m^2 + m^4$ when $m = 5$

PREVIEW
Prepare for
Lesson 1.6
in Exs. 45–53.

Solve the equation. Check your solution. (p. 18)

45. $x + 8 = -7$ 46. $-3y = 102$ 47. $\frac{7}{10}z = 70$
48. $4b - 3 = 17$ 49. $\frac{5}{4}c + 25 = -20$ 50. $-2d + 8 = -22$
51. $4j + 12 = 6j - 7$ 52. $3p - 15 = 4p - 1$ 53. $7(w + 1) = 3(w + 5)$

QUIZ for Lessons 1.3–1.5

Solve the equation. Check your solution. (p. 18)

1. $5b - 2 = 8$ 2. $2d - 3 = 8d + 15$
3. $2(m - 4) = m + 2$ 4. $\frac{2}{3}k + \frac{2}{7} = \frac{3}{7}k + \frac{1}{2}$

Solve the equation for y . Then find the value of y for the given value of x . (p. 26)

5. $4x + y = 12; x = 4$ 6. $3x - 2y = 14; x = 6$
7. $3xy - 4x = 19; x = 2$ 8. $11y + 2xy = 9; x = -5$

Look for a pattern in the table. Then write an equation that represents the table. (p. 34)

9.

x	0	1	2	3
y	0	13	26	39

10.

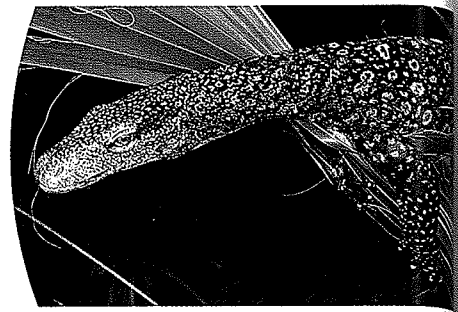
x	0	1	2	3
y	-5	-2	1	4

11. **TUTORING FEE** A chess tutor charges a fee for the first lesson that is 1.5 times the fee for later lessons. You spend \$315 for 10 lessons. How much does the first lesson cost? How much does a later lesson cost? (p. 34)
12. **FLOWER PRICES** You buy some calla lilies and peonies at a flower store. Calla lilies cost \$3.50 each and peonies cost \$5.50 each. The total cost of 12 flowers is \$52. How many calla lilies and how many peonies did you buy? (p. 34)



EXAMPLE 7 Write and use a compound inequality

BIOLOGY A monitor lizard has a temperature that ranges from 18°C to 34°C . Write the range of temperatures as a compound inequality. Then write an inequality giving the temperature range in degrees Fahrenheit.



Monitor lizard

Solution

The range of temperatures C can be represented by the inequality $18 \leq C \leq 34$. Let F represent the temperature in degrees Fahrenheit.

$$18 \leq C \leq 34$$

Write inequality.

$$18 \leq \frac{5}{9}(F - 32) \leq 34$$

Substitute $\frac{5}{9}(F - 32)$ for C .

$$32.4 \leq F - 32 \leq 61.2$$

Multiply each expression by $\frac{9}{5}$, the reciprocal of $\frac{5}{9}$.

$$64.4 \leq F \leq 93.2$$

Add 32 to each expression.

► The temperature of the monitor lizard ranges from 64.4°F to 93.2°F .

USE A FORMULA

In Example 7, use the temperature formula

$$C = \frac{5}{9}(F - 32).$$



GUIDED PRACTICE for Examples 5, 6, and 7

Solve the inequality. Then graph the solution.

9. $-1 < 2x + 7 < 19$

10. $-8 \leq -x - 5 \leq 6$

11. $x + 4 \leq 9$ or $x - 3 \geq 7$

12. $3x - 1 < -1$ or $2x + 5 \geq 11$

13. **WHAT IF?** In Example 7, write a compound inequality for a lizard whose temperature ranges from 15°C to 30°C . Then write an inequality giving the temperature range in degrees Fahrenheit.

1.6 EXERCISES

HOMEWORK KEY

○ = WORKED-OUT SOLUTIONS on p. WS2 for Exs. 13, 25, and 55

★ = STANDARDIZED TEST PRACTICE Exs. 2, 15, 36, 56, and 59

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: The set of all points on a number line that represent solutions of an inequality is called the ? of the inequality.

2. ★ **WRITING** The first transformation on page 42 can be written as follows:

$$\text{If } a, b, \text{ and } c \text{ are real numbers and } a > b, \text{ then } a + c > b + c.$$

Write similar statements for the other transformations listed on page 42.

EXAMPLE 1

on p. 41
for Exs. 3–10

GRAPHING INEQUALITIES Graph the inequality.

3. $x > 4$

4. $x < -1$

5. $x \leq -5$

6. $x \geq 3$

7. $6 \geq x$

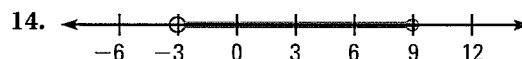
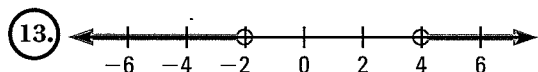
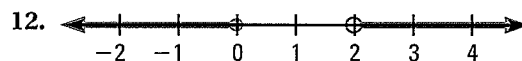
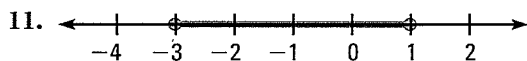
8. $-2 < x$

9. $x \geq -3.5$

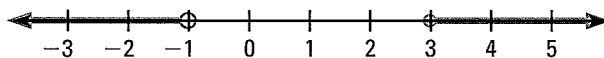
10. $x < 2.5$

EXAMPLE 2
on p. 41
for Exs. 11–21

WRITING COMPOUND INEQUALITIES Write the compound inequality that is represented by the graph.



15. **★ MULTIPLE CHOICE** What compound inequality is graphed below?



- (A) $-1 < x < 3$ (B) $x \leq -1$ or $x > 3$
(C) $x < -1$ or $x \geq 3$ (D) $x > -1$ or $x \leq 3$

GRAPHING COMPOUND INEQUALITIES Graph the compound inequality.

16. $2 \leq x \leq 5$ 17. $-3 < x < 4$ 18. $5 \leq x < 10$
19. $x < 0$ or $x > 2$ 20. $x \leq -1$ or $x > 1$ 21. $x > -2$ or $x < -5$

SOLVING INEQUALITIES Solve the inequality. Then graph the solution.

22. $x + 4 > 10$ 23. $x - 3 \leq -5$ 24. $4x - 8 \geq -4$
25. $15 - 3x > 3$ 26. $11 + 8x \geq 7$ 27. $4 + \frac{3}{2}x \leq 13$
28. $2x - 6 > 3 - x$ 29. $4x + 14 < 3x + 6$ 30. $5 - 8x \leq 19 - 10x$
31. $21x + 7 < 3x + 16$ 32. $18 + 2x \leq 9x + 4$ 33. $2(x - 4) > 4x + 6$

ERROR ANALYSIS Describe and correct the error in solving the inequality.

34.
$$\begin{aligned} 2x + 8 &\leq 6x - 4 \\ -4x &\leq -12 \\ x &\leq 3 \end{aligned}$$



35.
$$\begin{aligned} 10 + 3x &> 5x \\ 10 &< 2x \\ 5 &< x \end{aligned}$$



36. **★ OPEN-ENDED MATH** Write two different inequalities of the form $ax + b > c$ that have a solution of $x > 5$.

EXAMPLE 5
on p. 43
for Exs. 37–42

“AND” COMPOUND INEQUALITIES Solve the inequality. Then graph the solution.

37. $-5 < x + 1 < 4$ 38. $2 \leq x - 3 \leq 6$ 39. $-3 < 4 - x \leq 3$
40. $2 < 3x - 1 \leq 6$ 41. $-4 \leq 2 + 4x < 0$ 42. $0 \leq \frac{3}{4}x + 3 \leq 4$

EXAMPLE 6
on p. 43
for Exs. 43–48

“OR” COMPOUND INEQUALITIES Solve the inequality. Then graph the solution.

43. $x + 1 < -3$ or $x - 2 > 0$ 44. $x - 4 \leq -6$ or $x + 2 > 5$
45. $2x - 3 \leq -4$ or $3x + 1 \geq 4$ 46. $2 + 3x < -13$ or $4 + 2x > 7$
47. $0.3x - 0.5 < -1.7$ or $0.4x \geq 2.4$ 48. $-x - 4 \geq 1$ or $2 - 5x \leq -8$

CHALLENGE Solve the inequality. If there is no solution, write *no solution*. If the inequality is always true, write *all real numbers*.

49. $2(x - 4) > 2x + 1$ 50. $4x - 5 \leq 4(x + 2)$ 51. $2(3x - 1) > 3(2x + 3)$

PROBLEM SOLVING

EXAMPLE 3

on p. 42
for Exs. 52–53

- 52. SWIMMING** You have budgeted \$100 to improve your swimming over the summer. At your local pool, it costs \$50 to join the swim association and \$5 for each swim class. Write and solve an inequality to find the possible numbers of swim classes you can attend within your budget.

@HomeTutor for problem solving help at classzone.com

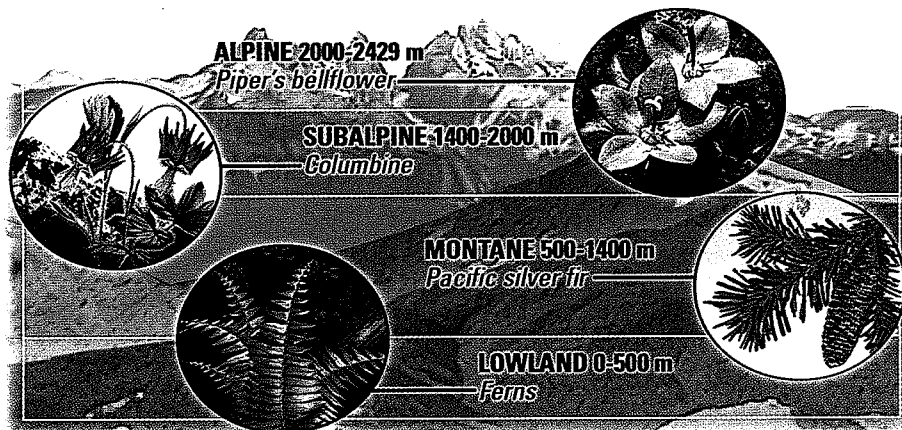
- 53. VIDEO CONTEST** You and some friends have raised \$250 to help make a video for a contest. You need \$35 to buy videotapes. It costs \$45 per day to rent the video camera. Write and solve an inequality to find the possible numbers of days you can rent the video camera.

@HomeTutor for problem solving help at classzone.com

- 54. WAKEBOARDING** What you wear when you wakeboard depends on the air temperature. Copy and complete the table by writing an inequality for each temperature range. Assume each range includes the lower temperature but not the higher temperature. (The first inequality has been written for you.)

Temperature	Gear	Inequality
60°F to 65°F	Full wetsuit	$60 \leq T < 65$
65°F to 72°F	Full leg wetsuit	?
72°F to 80°F	Wetsuit trunks	?
80°F or warmer	No special gear	?

- 55. BOTANY** In Olympic National Park in Washington, different plants grow depending on the elevation, as shown in the diagram. Assume each range includes the lower elevation but not the higher elevation.



- a. Write an inequality for elevations in the lowland zone.
 - b. Write an inequality for elevations in the alpine and subalpine zones combined.
 - c. Write an inequality for elevations *not* in the montane zone.
- 56. ★ MULTIPLE CHOICE** Canoe rental costs \$18 for the first two hours and \$3 per hour after that. You want to canoe for more than 2 hours but can spend no more than \$30. Which inequality represents the situation, where t is the total number of hours you can canoe?
- (A) $18 + t \leq 30$
(B) $18 + 3t \leq 30$
- (C) $18 + 3(t + 2) \leq 30$
(D) $18 + 3(t - 2) \leq 30$

EXAMPLE 7
on p. 44
for Exs. 57–58

57. **LAPTOP COMPUTERS** A computer manufacturer states that its laptop computer can operate within a temperature range of 50°F to 95°F . Write a compound inequality for the temperature range. Then rewrite the inequality in degrees Celsius.
58. **MULTI-STEP PROBLEM** On a certain highway, there is a minimum speed of 45 miles per hour and a maximum speed of 70 miles per hour.
- Write a compound inequality for the legal speeds on the highway.
 - Write a compound inequality for the illegal speeds on the highway.
 - Write each compound inequality from parts (a) and (b) so that it expresses the speeds in kilometers per hour. ($1 \text{ mi} \approx 1.61 \text{ km}$)
59. **★ EXTENDED RESPONSE** A math teacher announces that grades will be calculated by adding 65% of a student's homework score, 15% of the student's quiz score, and 20% of the student's final exam score. All scores range from 0 to 100 points.
- Write Inequalities** Write an inequality for each student that can be used to find the possible final exam scores that result in a grade of 85 or better.
 - Solve** Solve the inequalities from part (a).
 - Interpret** For which students is a grade of 85 or better possible? *Explain.*

Name	Homework	Quiz	Exam
Amy	84	80	w
Brian	80	100	x
Clara	75	95	y
Dan	80	90	z

60. **CHALLENGE** You are shopping for single-use cameras to hand out at a party. The daylight cameras cost $\$2.75$ and the flash cameras cost $\$4.25$. You must buy exactly 20 cameras and you want to spend between $\$65$ and $\$75$, inclusive. Write and solve a compound inequality for this situation. Then list all the solutions that involve whole numbers of cameras.

MIXED REVIEW

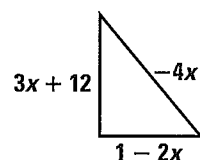
PREVIEW
Prepare for
Lesson 1.7
in Exs. 61–68.

Find the mean of the two numbers. (p. 1005)

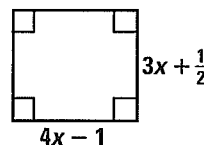
61. 9, 15 62. 21, 63 63. 80, 120 64. 163, 124
65. 116, 135 66. 327, 525 67. $5, \frac{9}{4}$ 68. $\frac{3}{4}, \frac{1}{6}$

Solve for x . Then find the length of each side of the figure. (p. 18)

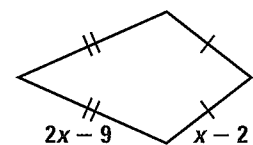
69. Perimeter = 19



70. Perimeter = 34



71. Perimeter = 50



Look for a pattern in the table. Then write an equation that represents the table. (p. 34)

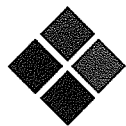
72.

x	0	1	2	3
y	12	20	28	36

73.

x	0	1	2	3
y	425	325	225	125

Another Way to Solve Example 3, page 42



MULTIPLE REPRESENTATIONS Example 3 of Lesson 1.6 involved solving an inequality using algebra. You can also solve an inequality using a table or a graphing calculator's *test* feature, which tells when an inequality is true or false.

PROBLEM

FAIR You have \$50 to spend at a county fair. You spend \$20 for admission. You want to play a game that costs \$1.50. Describe the possible numbers of times you can play the game.

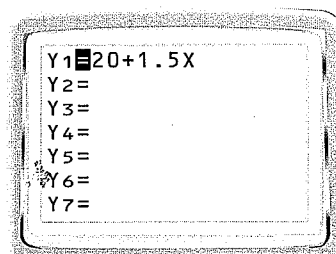
METHOD 1

Using a Table One alternative approach is to make a table of values.

STEP 1 Write an expression for the total cost of admission and playing x games.

$$\begin{array}{ccccccc} \text{Admission} & & & & \text{Cost per} & & \text{Number} \\ \text{fee} & + & & & \text{game} & \cdot & \text{of games} \\ & & & & & & \\ \downarrow & & & & \downarrow & & \downarrow \\ 20 & + & & & 1.50 & \cdot & x \end{array}$$

STEP 2 Enter the equation $y = 20 + 1.5x$ into a graphing calculator.



STEP 3 Make a table of values for the equation.

Use TblStart = 0 and $\Delta Tbl = 1$ to see these values.

X	Y1
0	20
1	21.5
2	23
3	24.5
4	26
X=0	

STEP 4 Scroll through the table of values to find when the total cost is \$50. You can see that $y = 50$ when $x = 20$.

X	Y1
18	47
19	48.5
20	50
21	51.5
22	53
X=20	

► The table suggests that $20 + 1.5x \leq 50$ when $x \leq 20$. So, you can play the game at the fair 20 times or fewer.

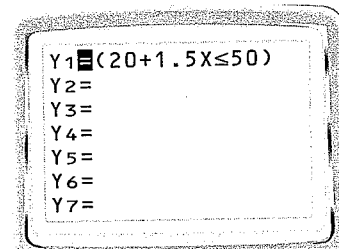
METHOD 2**Using a Graph** Another approach is to use a graph.

If your graphing calculator has a *test* feature, you can enter the inequality and evaluate its truth for various values of x .

- When the inequality is *true*, the calculator returns a 1.
- When the inequality is *false*, the calculator returns a 0.

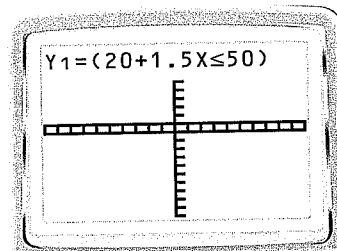
STEP 1 Enter $y = (20 + 1.5x \leq 50)$ into a graphing calculator.

Press **2nd** [TEST] **6** to enter the \leq symbol.



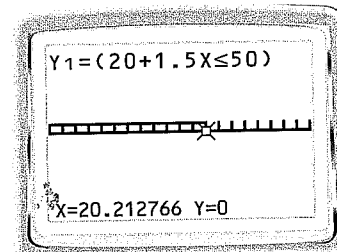
STEP 2 Graph the result.

The y -value is 1 for all x -values that make the inequality true.



STEP 3 Find the point where the inequality changes from true to false by using the *trace* feature.

- The graph suggests that the inequality is true when $x \leq 20$. So, you can play the game at the fair 20 times or fewer.

**PRACTICE**

1. **REASONING** Determine the equation that gives the table below. For what x -values is $y < -500$?

X	Y1
0	200
1	165
2	130
3	95
4	60

X=0

2. **GIFT** You have \$16.50 to spend for a friend's birthday. You spend \$3 on a card and want to buy some chocolates that cost \$.75 each. What are the numbers of chocolates you can buy? Solve using a table and using a graph.

3. **SALESPERSON** A salesperson has a weekly salary of \$1550 and gets a 5% commission on sales. What are the amounts the salesperson can sell to earn at least \$1900 per week? Solve using a table and using a graph.

4. **WRITING** Explain how to use a table like the one below to solve $0.5x - 1.5 \leq 3 - 0.4x$.

X	Y1	Y2
0	-1.5	3
1	-1	2.6
2	-0.5	2.2
3	0	1.8
4	0.5	1.4

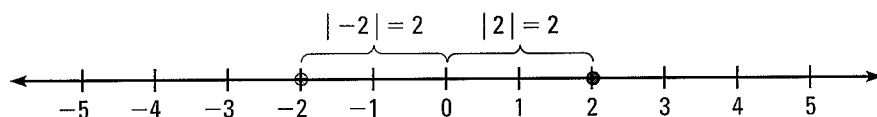
X=0

1.7 Absolute Value Equations and Inequalities

MATERIALS • 13 index cards numbered with the integers from -6 to 6

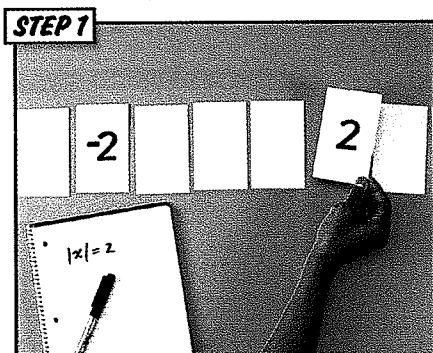
QUESTION What does the solution of an absolute value equation or inequality look like on a number line?

The *absolute value* of a number x , written $|x|$, is the distance the number is from 0 on a number line. Because 2 and -2 are both 2 units from 0, $|2| = 2$ and $|-2| = 2$. The absolute value of a number is never negative.



EXPLORE Find solutions of absolute value equations and inequalities

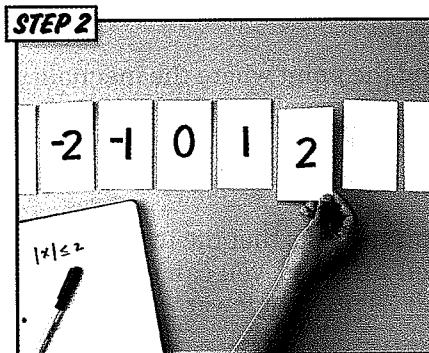
Work with a partner. Place the numbered index cards in a row to form a number line. Then turn all the cards face down.



Solve equations

Turn over cards to reveal numbers that are solutions of the equations below.

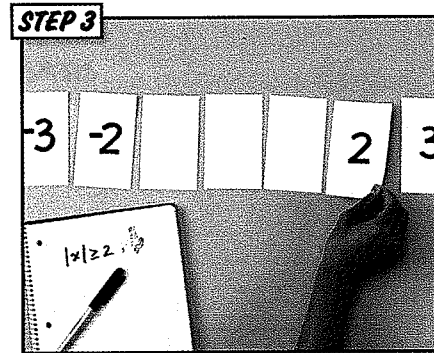
- a. $|x| = 2$
- b. $|x - 2| = 1$
- c. $|x + 1| = 3$



Solve inequalities with \leq

Turn over cards to reveal numbers that are solutions of the inequalities below.

- d. $|x| \leq 2$
- e. $|x - 2| \leq 1$
- f. $|x + 1| \leq 3$



Solve inequalities with \geq

Turn over cards to reveal numbers that are solutions of the inequalities below.

- g. $|x| \geq 2$
- h. $|x - 2| \geq 1$
- i. $|x + 1| \geq 3$

DRAW CONCLUSIONS Use your observations to complete these exercises

1. Describe the solutions of the absolute value equations in Step 1. Will all absolute value equations have the same number of solutions? Explain.
2. Compare the solutions of the absolute value inequalities in Steps 2 and 3. How does the inequality symbol (\leq or \geq) affect the pattern of the solutions?

**GUIDED PRACTICE** for Examples 5 and 6

Solve the inequality. Then graph the solution.

10. $|x + 2| < 6$

11. $|2x + 1| \leq 9$

12. $|7 - x| \leq 4$

13. **GYMNASTICS** For Example 6, write an absolute value inequality describing the *unacceptable* mat thicknesses.**1.7 EXERCISES****HOMEWORK KEY**○ = **WORKED-OUT SOLUTIONS**
on p. WS2 for Exs. 21, 47, and 77★ = **STANDARDIZED TEST PRACTICE**
Exs. 2, 33, 40, 63, and 64◆ = **MULTIPLE REPRESENTATIONS**
Ex. 78**SKILL PRACTICE**

- VOCABULARY** What is an extraneous solution of an equation?
- ★ **WRITING** The absolute value of a number cannot be negative. How, then, can the absolute value of x be $-x$ for certain values of x ?

CHECKING SOLUTIONS Decide whether the given number is a solution of the equation.

3. $|b - 1| = 14; -13$

4. $|d + 6| = 10; -4$

5. $|32 - 6f| = 20; -2$

6. $|2m + 6| = 10; -8$

7. $|3n - 7| = 4; 1$

8. $|17 - 8r| = 15; 4$

EXAMPLE 1on p. 51
for Exs. 9–20**SOLVING EQUATIONS** Solve the equation. Graph the solution.

9. $|x| = 9$

10. $|y| = -5$

11. $|z| = 0$

12. $|f - 5| = 3$

13. $|g - 2| = 7$

14. $|h - 4| = 4$

15. $|k + 3| = 6$

16. $|m + 5| = 1$

17. $|n + 9| = 10$

18. $|6 - p| = 4$

19. $|5 - q| = 7$

20. $|-4 - r| = 4$

EXAMPLE 2on p. 52
for Exs. 21–32**SOLVING EQUATIONS** Solve the equation.

21. $|2d - 5| = 13$

22. $|3g + 14| = 7$

23. $|7h - 10| = 4$

24. $|3p - 6| = 21$

25. $|2q + 3| = 11$

26. $|4r + 7| = 43$

27. $|5 + 2j| = 9$

28. $|6 - 3k| = 21$

29. $|20 - 9m| = 7$

30. $|\frac{1}{4}x - 3| = 10$

31. $|\frac{1}{2}y + 4| = 6$

32. $|\frac{2}{3}z - 6| = 12$

33. ★ **SHORT RESPONSE** The equation $|5x - 10| = 45$ in Example 2 has two solutions. Does the equation $|5x - 10| = -45$ also have two solutions? Explain.**EXAMPLE 3**on p. 52
for Exs. 34–42**EXTRANEIOUS SOLUTIONS** Solve the equation. Check for extraneous solutions.

34. $|3x - 4| = x$

35. $|x + 24| = -7x$

36. $|8x - 1| = 6x$

37. $|4x + 5| = 2x + 4$

38. $|9 - 2x| = 10 + 3x$

39. $|8 + 5x| = 7 - x$

40. ★ **MULTIPLE CHOICE** What is (are) the solution(s) of $|3x + 7| = 5x$?

- (A) $-4, -\frac{2}{3}$ (B) $-\frac{7}{8}, \frac{7}{2}$ (C) $\frac{7}{8}, \frac{7}{2}$ (D) $\frac{7}{2}$

ERROR ANALYSIS Describe and correct the error in solving the equation.

41. $|5x - 9| = x + 3$
 $5x - 9 = x + 3$ or $5x - 9 = -x + 3$
 $4x - 9 = 3$ or $6x - 9 = 3$
 $4x = 12$ or $6x = 12$
 $x = 3$ or $x = 2$
 The solutions are 3 and 2. ✗

42. $|n - 7| = 3n - 1$
 $n - 7 = 3n - 1$ or $n - 7 = -3n + 1$
 $-7 = 2n - 1$ or $4n - 7 = 1$
 $-6 = 2n$ or $4n = 8$
 $-3 = n$ or $n = 2$
 The solutions are -3 and 2. ✗

EXAMPLES
4 and 5
 on pp. 53–54
 for Exs. 43–63

SOLVING INEQUALITIES Solve the inequality. Then graph the solution.

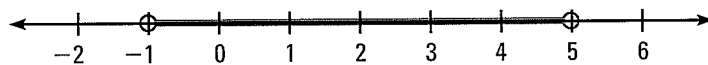
43. $|j| \leq 5$ 44. $|k| > 4$ 45. $|m - 2| < 7$ 46. $|n - 11| \geq 1$
 47. $|d + 4| \geq 3$ 48. $|f + 6| < 2$ 49. $|g - 1| > 0$ 50. $|h + 10| \leq 10$
 51. $|3w - 15| < 30$ 52. $|2x + 6| \geq 10$ 53. $|4y - 9| \leq 7$ 54. $|5z + 1| > 14$
 55. $|16 - p| > 3$ 56. $|24 - q| \leq 11$ 57. $|7 - 2r| < 19$ 58. $|19 - 5t| > 7$
 59. $|\frac{1}{2}x - 10| \leq 4$ 60. $|\frac{1}{3}m - 15| < 6$ 61. $|\frac{1}{7}y + 2| - 5 > 3$ 62. $|\frac{2}{5}n - 8| + 4 \geq 12$

 at classzone.com

63. ★ **MULTIPLE CHOICE** What is the solution of $|6x - 9| \geq 33$?

- (A) $-4 \leq x \leq 7$ (B) $-7 \leq x \leq 4$
 (C) $x \leq -4$ or $x \geq 7$ (D) $x \leq -7$ or $x \geq 4$

64. ★ **MULTIPLE CHOICE** Which absolute value inequality represents the graph shown below?



- (A) $-1 < |x| < 5$ (B) $|x + 2| < 3$ (C) $|x - 2| < 3$ (D) $|x - 2| < 5$

65. **REASONING** For the equation $|ax + b| = c$ (where a , b , and c are real numbers and $a \neq 0$), describe the value(s) of c that yield two solutions, one solution, and no solution.

SOLVING INEQUALITIES Solve the inequality. Then graph the solution.

66. $|x + 1| \geq -16$ 67. $|2x - 1| < -25$ 68. $|7x + 3| \leq 0$ 69. $|x - 9| > 0$

CHALLENGE Solve the inequality for x in terms of a , b , and c . Assume a , b , and c are real numbers and $c > 0$.

70. $|ax + b| < c$ where $a > 0$ 71. $|ax + b| \geq c$ where $a > 0$
 72. $|ax + b| \leq c$ where $a < 0$ 73. $|ax + b| > c$ where $a < 0$

PROBLEM SOLVING

EXAMPLE 5
on p. 54
for Exs. 74–78

- 74. GYMNASTICS** The horizontal bar used in gymnastics events should be placed 110.25 inches above the ground, with a tolerance of 0.4 inch. Write an absolute value inequality for the acceptable bar heights.

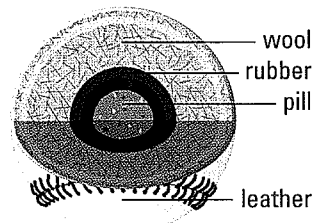
@HomeTutor for problem solving help at classzone.com

- 75. SOIL PH LEVELS** Cucumbers grow in soil having a pH level of 6.5, with a tolerance of 1 point on the pH scale. Write an absolute value inequality that describes the pH levels of soil in which cucumbers can grow.

@HomeTutor for problem solving help at classzone.com

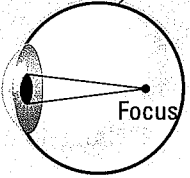
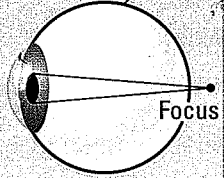
- 76. MULTI-STEP PROBLEM** A baseball has a cushioned cork center called the *pill*. The pill must weigh 0.85 ounce, with a tolerance of 0.05 ounce.

- a. Write an absolute value inequality that describes the acceptable weights for the pill of a baseball.
- b. Solve the inequality to find the acceptable weights for the pill.
- c. Look back at Example 5 on page 54. Find the minimum and maximum percentages of a baseball's total weight that the pill can make up.



- 77. MANUFACTURING** A regulation basketball should weigh 21 ounces, with a tolerance of 1 ounce. Write an absolute value inequality describing the weights of basketballs that should be *rejected*.

- 78. MULTIPLE REPRESENTATIONS** The strength of eyeglass lenses is measured in units called *diopters*. The diopter number x is negative for nearsighted vision and positive for farsighted vision.

Nearsightedness (focus is in front of retina)		Retina  Focus	Retina  Focus	Farsightedness (focus is behind retina)	
Mild	$ x + 1.5 < 1.5$			Mild	$ x - 1 < 1$
Moderate	$ x + 4.5 < 1.5$	Moderate	$ x - 3 < 1$		
Severe	$ x + 7.5 < 1.5$	Severe	$ x - 5 < 1$		

- a. **Writing Inequalities** Write an equivalent compound inequality for each vision category shown above. Solve the inequalities.
- b. **Making a Graph** Illustrate the six vision categories by graphing their ranges of diopter numbers on the same number line. Label each range with the corresponding category name.

EXAMPLE 6
on p. 54
for Exs. 79–81

- 79. SLEEPING BAGS** A manufacturer of sleeping bags suggests that one model is best suited for temperatures between 30°F and 60°F, inclusive. Write an absolute value inequality for this temperature range.

- 80. TEMPERATURE** The recommended oven setting for cooking a pizza in a professional brick-lined oven is between 550°F and 650°F, inclusive. Write an absolute value inequality for this temperature range.

81. AUDIBLE FREQUENCIES An elephant can hear sounds with frequencies from 16 hertz to 12,000 hertz. A mouse can hear sounds with frequencies from 1000 hertz to 91,000 hertz. Write an absolute value inequality for the hearing range of each animal.

82. CHALLENGE The depth finder on a fishing boat gives readings that are within 5% of the actual water depth. When the depth finder reading is 250 feet, the actual water depth x lies within a range given by the following inequality:

$$|x - 250| \leq 0.05x$$

- Write the absolute value inequality as a compound inequality.
- Solve each part of the compound inequality for x . What are the possible actual water depths if the depth finder's reading is 250 feet?

MIXED REVIEW

PREVIEW

Prepare for
Lesson 2.1
in Exs. 83–94.

Plot the points in the same coordinate plane. (p. 987)

83. (4, 4)

84. (7, -8)

85. (-3, 0)

86. (0, -6)

87. (-2, -3)

88. (-5, 2)

Evaluate the expression for the given value of the variable. (p. 10)

89. $6m - 10$; $m = 4$

90. $-4n + 18$; $n = 3$

91. $5p + 17$; $p = 0$

92. $7q + 3$; $q = -4$

93. $-2r - 3$; $r = 7$

94. $10t - 5$; $t = -3$

Solve the equation for y . Then find the value of y for the given value of x . (p. 26)

95. $5x + y = 14$; $x = 8$

96. $-3x + y = 12$; $x = -9$

97. $8x - 4y = 32$; $x = -3$

98. $-6x + 15y = 33$; $x = 10$

QUIZ for Lessons 1.6–1.7

Solve the inequality. Then graph the solution. (p. 41)

1. $4k - 17 < 27$

2. $14n - 8 \geq 90$

3. $-9p + 15 \leq 96$

4. $-8r - 11 > 45$

5. $3(x - 7) < 6(10 - x)$

6. $-25 - 4z > 66 - 17z$

Solve the equation or inequality. (p. 51)

7. $|x - 6| = 9$

8. $|3y + 3| = 12$

9. $|2z + 5| = -9z$

10. $|p + 7| > 2$

11. $|2q - 3| \leq 3$

12. $|5 - r| \geq 4$

13. TEST SCORES Your final grade in a course is 80% of your current grade, plus 20% of your final exam score. Your current grade is 83 and your goal is to get a final grade of 85 or better. Write and solve an inequality to find the final exam scores that will meet your goal. (p. 41)

14. GROCERY WEIGHTS A container of potato salad from your grocer's deli is supposed to weigh 1.5 pounds, with a tolerance of 0.025 pound. Write and solve an absolute value inequality that describes the acceptable weights for the container of potato salad. (p. 51)



Lessons 1.5–1.7

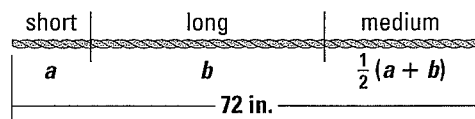
- MULTI-STEP PROBLEM** A hybrid car gets about 60 miles per gallon of gas in the city and about 51 miles per gallon on the highway. During one week, the hybrid uses 12 gallons of gas and travels 675 miles.
 - Write a verbal model for the total distance driven. Then write an equation based on the verbal model.
 - Solve the equation to find the amounts of gas used in the city and on the highway.
 - Tell how many miles were driven in the city and on the highway.

- MULTI-STEP PROBLEM** A popcorn manufacturer's ideal weight for a bag of microwave popcorn is 3.5 ounces, with a tolerance of 0.25 ounce.
 - Write an absolute value inequality for the acceptable weights of a bag of popcorn.
 - Solve the inequality. What is the range of acceptable weights?

- EXTENDED RESPONSE** You are draining a swimming pool. The table shows the depth of the water at different times.

Time (h), t	0	1	2	3
Depth (ft), d	12	10.5	9	7.5

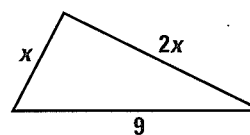
- Write an equation for the depth.
 - Use your equation to find how long it will take for the pool to be empty.
 - Does your equation make sense for times greater than the value you found in part (b)? *Explain.*
- OPEN-ENDED** For a rope trick, a magician cuts a 72 inch piece of rope into three pieces of different lengths. The length of one piece must be the mean of the lengths of the other two pieces.



Find the length of the medium piece. Then give possible lengths for the short and long pieces.

- SHORT RESPONSE** A video store rents movies for \$2.95 each. Recently, the store has added a special deal that allows you to rent an unlimited number of movies for \$15.95 per month. *Explain* when the special deal is less expensive than renting movies at the usual price. Write and solve an inequality to justify your answer.

- EXTENDED RESPONSE** The triangle inequality relationship from geometry states that the sum of the lengths of any two sides of a triangle is greater than the length of the third side.



- Write three different inequalities for the triangle.
 - Solve the three inequalities for x .
 - Based on your results from part (b), what is the range of possible values for x ?
 - Use your results to draw three different triangles that meet the conditions shown in the diagram.
- MULTI-STEP PROBLEM** Oxygen exists as a liquid between -369°F and -297°F , inclusive. Write the temperature range for liquid oxygen as a compound inequality in degrees Fahrenheit. Then rewrite the temperature range in degrees Celsius.

- GRIDDED ANSWER** A football kicker scores 1 point for each extra point and 3 points for each field goal. One season, a kicker made 34 extra points and scored a total of 112 points. How many field goals did the kicker make?



BIG IDEAS

For Your Notebook

Big Idea 1

Using Properties to Evaluate and Simplify Expressions

	Example	Answer
To evaluate a numerical expression , use order of operations and properties of real numbers.	$3 + (-3)^2$	$3 + 9 = 12$
To evaluate an algebraic expression , substitute the value(s) of the variable(s) into the expression, and then evaluate the resulting numerical expression.	$4x - 5$ when $x = 1$	$4(1) - 5 = -1$
To simplify an algebraic expression , combine like terms.	$3y - 4 + 2y - 6$	$5y - 10$

Big Idea 2

Using Problem Solving Strategies and Verbal Models

You may be able to write a **verbal model** that describes a real-world problem and use it to write an equation or inequality you can solve. To write the verbal model, analyze the information you are given and use a problem solving strategy if appropriate.

If this is what you know...	...try this strategy.
A formula can be applied to the situation.	Use a Formula
Numerical information is given in a table or a list.	Look for a Pattern
There is a geometric or physical context.	Draw a Diagram

Big Idea 3

Solving Linear and Absolute Value Equations and Inequalities

Use the following guidelines when solving equations and inequalities.

<p>Linear Equation</p> $ax + b = 0$ <p>Use properties of equality to isolate x. Add or subtract the same number from each side of the equation, or multiply or divide each side by the same nonzero number.</p>	<p>Linear Inequality</p> $ax + b \leq 0$ <p>Use properties similar to those used in solving equations. Remember to reverse the inequality when multiplying or dividing by a negative number.</p>								
<p>Absolute Value Equation</p> $ ax + b = c$ <p>Rewrite as follows and solve:</p> $ax + b = c \text{ or } ax + b = -c$ <p>Check for extraneous solutions.</p>	<p>Absolute Value Inequality</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">$ax + b > c$</td> <td style="text-align: center;">$ax + b < c$</td> </tr> <tr> <td style="text-align: center;">↓</td> <td style="text-align: center;">↓</td> </tr> <tr> <td style="text-align: center;">Solve</td> <td style="text-align: center;">Solve</td> </tr> <tr> <td style="text-align: center;">$ax + b < -c$ or $ax + b > c$</td> <td style="text-align: center;">$-c < ax + b < c$</td> </tr> </table>	$ ax + b > c$	$ ax + b < c$	↓	↓	Solve	Solve	$ax + b < -c$ or $ax + b > c$	$-c < ax + b < c$
$ ax + b > c$	$ ax + b < c$								
↓	↓								
Solve	Solve								
$ax + b < -c$ or $ax + b > c$	$-c < ax + b < c$								

REVIEW KEY VOCABULARY

- opposite, p. 4
- reciprocal, p. 4
- numerical expression, p. 10
- power, p. 10
- exponent, p. 10
- base, p. 10
- variable, p. 11
- algebraic expression, p. 11
- term, p. 12
- variable term, p. 12
- constant term, p. 12
- coefficient, p. 12
- like terms, p. 12
- equivalent expressions, p. 12
- identity, p. 12
- equation, p. 18
- linear equation, p. 18
- solution of an equation, p. 18
- equivalent equations, p. 18
- formula, p. 26
- solve for a variable, p. 26
- verbal model, p. 34
- linear inequality, p. 41
- solution of an inequality, p. 41
- graph of an inequality, p. 41
- compound inequality, p. 41
- equivalent inequalities, p. 42
- absolute value, p. 51
- extraneous solution, p. 52

VOCABULARY EXERCISES

1. Copy and complete: In a power, the ? represents the number of times the ? is used as a factor.
2. Copy and complete: If substituting a number for a variable in an equation results in a true statement, then the number is a(n) ? of the equation.
3. Copy and complete: A(n) ? is an apparent solution that must be rejected because it does not satisfy the original equation.
4. Identify the like terms in the expression $40 + 3x^3 + 3x^2 - 7 - x^2$.
5. Give an example of two equivalent algebraic expressions.
6. **WRITING** Compare the procedures for solving a linear equation and a linear inequality. How are they similar? How are they different?

REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 1.

1.1

Apply Properties of Real Numbers

pp. 2–9

EXAMPLE

Identify the property that the statement illustrates.

a. $2(w + \ell) = 2w + 2\ell$

Distributive property

b. $6 + (2 + 4) = 6 + (4 + 2)$

Commutative property of addition

EXERCISES

Identify the property that the statement illustrates.

7. $17 \cdot \frac{1}{17} = 1$

8. $60 + 0 = 60$

9. $3a + 7a = (3 + 7)a$

EXAMPLE 3

on p. 4
for Exs. 7–9

1.2

Evaluate and Simplify Algebraic Expressions

pp. 10–16

EXAMPLE

Simplify the expression.

$$\begin{aligned} 5(y - 4) - 3(2y - 9) &= 5y - 20 - 6y + 27 && \text{Distributive property} \\ &= (5y - 6y) + (-20 + 27) && \text{Group like terms.} \\ &= -y + 7 && \text{Combine like terms.} \end{aligned}$$

EXERCISES

Simplify the expression.

10. $25x + 14 - 17 - 6x$

11. $6y + 12x - 12y - 9x$

12. $6(n - 2) - 8n + 40$

13. $5(2b + 3) + 8(b - 6)$

14. $3g + 9g^2 - 12g^2 + g$

15. $7t^4 + 7t^2 - 2t^2 - 9t^4$

16. **TAXI RATES** A New York City taxi charges \$2.50, plus \$.40 for each fifth of a mile if it is not delayed by traffic. Write an expression for the cost of the ride if you travel x miles in the taxi with no traffic delays.

EXAMPLES

3 and 4

on pp. 11–12
for Exs. 10–16

1.3

Solve Linear Equations

pp. 18–24

EXAMPLE

Solve $-4(3x + 5) = -2(5 - x)$.

$$\begin{aligned} -4(3x + 5) &= -2(5 - x) && \text{Write original equation.} \\ -12x - 20 &= -10 + 2x && \text{Distributive property} \\ -20 &= -10 + 14x && \text{Add } 12x \text{ to each side.} \\ -10 &= 14x && \text{Add } 10 \text{ to each side.} \\ -\frac{5}{7} &= x && \text{Divide each side by } 14 \text{ and simplify.} \end{aligned}$$

EXERCISES

Solve the equation. Check your solution.

17. $24x + 16 = 12$

18. $-6y + 15 = -9$

19. $4(q - 5) = 16$

20. $7m + 38 = -5m - 16$

21. $48j + 25 = 12j - 11$

22. $8(2n - 5) = 3(6n - 2)$

23. **SALES TAX** You buy a jacket, and the sales tax is 6%. The total cost is \$79.49. Find the cost of the jacket before the tax.

24. **FOOD SHOPPING** At a vegetable stand, you bought 3 pounds of peppers for \$4.50. Green peppers cost \$1 per pound and orange peppers cost \$4 per pound. Find how many pounds of each kind of pepper you bought.

EXAMPLES

1, 2, 3, and 4

on pp. 18–20
for Exs. 17–24

1.4 Rewrite Formulas and Equations

pp. 26–32

EXAMPLE

Solve $5x - 11y = 7$ for y . Then find the value of y when $x = 4$.

STEP 1 $5x - 11y = 7$

Write original equation.

$$-11y = 7 - 5x$$

Subtract $5x$ from each side.

$$y = -\frac{7}{11} + \frac{5}{11}x$$

Divide each side by -11 .

STEP 2 $y = -\frac{7}{11} + \frac{5}{11}(4)$ Substitute 4 for x .

$$y = \frac{13}{11}$$

Simplify.

EXERCISES

Solve the equation for y . Then find the value of y for the given value of x .

25. $10x + y = 7$; $x = 3$


26. $8y - 3x = 18$; $x = 2$

27. $xy - 6y = -15$; $x = 5$

28. $4x = 6y + 9$; $x = 9$

29. $5x - 2y = 10$; $x = -6$

30. $x - 3xy = 1$; $x = -5$

31.  **GEOMETRY** The formula $S = 2\pi rh + 2\pi r^2$ gives the surface area S of a cylinder with height h and radius r . Solve the formula for h . Find h if $r = 5$ centimeters and $S = 400$ square centimeters.

EXAMPLES
2, 3, and 4
on pp. 27–28
for Exs. 25–31

1.5 Use Problem Solving Strategies and Models

pp. 34–40

EXAMPLE

Find the time it takes to drive 525 miles at 50 miles per hour.

Distance (miles)	=	Rate (miles/hour)	·	Time (hours)
↓		↓		↓
525	=	50	·	t

$525 = 50t$ Write equation.

$10.5 = t$ Divide each side by 50.

▶ It takes 10.5 hours to drive 525 miles at 50 miles per hour.

EXERCISES

32. **AVERAGE SPEED** It takes 3 hours for a train to travel 175 miles. What is the average speed of the train?
33. **CAR RENTAL** While on vacation, your family rented a car for \$293. The car rental cost \$180, plus \$.25 for every mile driven over 150 miles. How many miles did you drive while on vacation?

EXAMPLES
1 and 4
on pp. 34–36
for Exs. 32–33

1.6 Solve Linear Inequalities

pp. 41–47

EXAMPLESolve $25 - 3x \leq 10$. Then graph the solution.

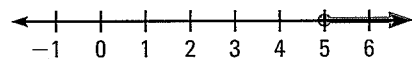
$$25 - 3x \leq 10$$

Write original inequality.

$$-3x \leq -15$$

Subtract 25 from each side.

$$x \geq 5$$

Divide each side by -3 and reverse the inequality.

Graph the solution.

EXERCISES

Solve the inequality. Then graph the solution.

34. $2x - 3 < -1$

35. $7 - 3x \geq -11$

36. $15x + 8 > 9x - 22$

37. $13x + 24 \leq 16 - 3x$

38. $-5 < 10 - x < 5$

39. $-8 \leq 3x + 1 \leq 10$

40. **GEOMETRY** A triangle has sides of lengths 10, $2x$, and $3x$. The sum of the lengths of any two sides is greater than the length of the third side. Write and solve three inequalities to find the possible values of x .

EXAMPLES
1, 2, 3, and 4
on pp. 41–43
for Exs. 34–40

1.7 Solve Absolute Value Equations and Inequalities

pp. 51–58

EXAMPLESolve $|3x - 7| > 2$. Then graph the solution.

$$|3x - 7| > 2$$

Write original inequality.

$$3x - 7 < -2 \quad \text{or} \quad 3x - 7 > 2$$

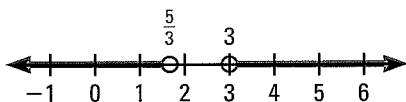
Write equivalent compound inequality.

$$3x < 5 \quad \text{or} \quad 3x > 9$$

Add 7 to each side.

$$x < \frac{5}{3} \quad \text{or} \quad x > 3$$

Divide each side by 3.



Graph the solution.

EXERCISES

Solve the equation. Check for extraneous solutions.

41. $|3p + 2| = 7$

42. $|9q - 5| = 2q$

43. $|8r + 1| = 3r$

Solve the inequality. Then graph the solution.

44. $|x - 5| \geq 1$

45. $|5 - 2y| > 7$

46. $|6z + 5| \leq 25$

47. **VOLLEYBALL** The circumference of a volleyball should be 26 inches, with a tolerance of 0.5 inch. Write and solve an absolute value inequality that describes the acceptable circumferences of a volleyball.

EXAMPLES
2, 3, 4, and 5
on pp. 52–54
for Exs. 41–47

CHAPTER TEST

Graph the numbers on a number line.

1. $-2, -\frac{7}{4}, 6.5, \sqrt{30}, \frac{1}{3}$

2. $\frac{9}{2}, 0.8, -5.5, -\sqrt{10}, -\frac{3}{4}$

Use properties and definitions of operations to show that the statement is true. *Justify* each step.

3. $5 + (x - 5) = x$

4. $(3d + 7) - d + 5 = 2d + 12$

Evaluate the expression for the given values of x and y .

5. $4x - 6y$ when $x = 5$ and $y = -3$

6. $3x^2 - 9y$ when $x = 2$ and $y = 4$

Simplify the expression.

7. $5n + 10 - 8n + 6$

8. $10m - 4(3m + 7) + 6m$

9. $11 + q - 3q^2 + 18q^2 - 2$

10. $9t^2 + 14 - 17t + 6t - 8t^2$

11. $5(x - 3y) + 2(4y - x)$

12. $5(2u + 3w) - 2(5u - 7w)$

Solve the equation. Check your solution.

13. $5n + 11 = -9$

14. $6k + 7 = 4 + 12k$

15. $-t - 2 = 9(t - 8)$

Solve the equation for y . Then find the value of y for the given value of x .

16. $12x - 28y = 40; x = 6$

17. $x + 4y = 12; x = 2$

18. $15y + 2xy = -30; x = 5$

Solve the inequality. Then graph the solution.

19. $-5x - 6 < 19$

20. $x + 22 \geq -3x - 10$

21. $5 < 2x + 3 \leq 11$

Solve the equation. Check for extraneous solutions.

22. $|3d - 4| = 14$

23. $|f + 3| = 2f + 4$

24. $|10 - 7g| = 2g$

Solve the inequality. Then graph the solution.

25. $|x - 5| \leq 30$

26. $|3y + 4| > 2$

27. $|\frac{2}{3}z - 5| < 5$

28. **WIRELESS NETWORK** To set up a wireless network for Internet access at home, you buy a network router for \$75. The fee for DSL service is \$18 per month. Write an expression for the amount of money you spend in n months. How much money do you spend in 12 months?

29. **CAR REPAIR** The bill for the repair of a car was \$420. The cost of parts was \$240. The cost of labor was \$45 per hour. How many hours did the repair take?

30. **HOUSEHOLD CHORES** You can wash one window in 15 minutes and your sister can wash one window in 20 minutes. How many minutes will it take to wash 12 windows if you work together?

31. **GEOMETRY** The formula $V = \frac{1}{3}\pi r^2 h$ gives the volume V of a cone with height h and base radius r . Solve the formula for h . Then find h when $r = 2$ inches and $V = 45$ cubic inches.

