Terms

ary pages 651–657

ay wish to preteach some of the key used in this chapter. Particularly for h Language Learners (ELL), ıting the vocabulary before the ɜr or lesson begins gives students a start into understanding the new ial. Writing new words on poster pointing to the words as you say then displaying the poster for a of time is a useful technique.

ɔn property of inequalities (p. 175)
ısion (p. 192)
ional statement (p. 192)
rse (p. 192)
(p. 172)
ıesis (p. 192)
ılity (p. 172)
lication property
nequalities (p. 180)

CHAPTER 4

What You'll Learn in Chapter 4

- How to graph inequalities
- How to solve inequalities in one variable
- How to write inequalities to solve problems
- How to use logical reasoning to solve problems

Skills & Concepts You Need for Chapter 4

2-2 Graph each number on the number line.

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

Use the proper symbol $>$ or $<$.

4. $-\frac{3}{4} \square -\frac{2}{5}$ **5.** $-1.5 \square 0.65$ **6.** $\frac{3}{4} \square -2$

3-3 Solve.

7. $3x - 2 = 7$ **8.** $-6x + 4 = 28$

9. $40 - 2x = 26$ **10.** $5x + 3x = 64$

11. $2(5y + 3) = 56$ **12.** $8(3a + 5) + a = 65$

3-4 Write as an algebraic expression.

13. the sum of three consecutive even integers

14. one half of the number plus 12

15. thirty-two less than twice the number

16. two greater than 3 times a number

3-5 Solve.

17. $2x + 20 + 33x = 80 + 15x$ **18.** $3(2x - 1) + 4 = x + 25$

19. $14p - 10 = 8 + 2p$ **20.** $4(2x + 1) = 3(x + 13)$

Solve.

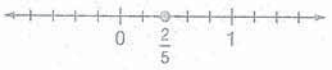
21. $\frac{b}{3} - 2 = 6$ **22.** $\frac{2}{9}b + \frac{1}{3}b = \frac{4}{9} - \frac{1}{3}b$

23. $0.9x - 0.5x = 6$ **24.** $0.32y = 0.3y + 32$

Skills & Concepts You Need for Chapter 4

1.

2.



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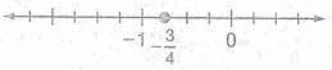


4. $<$
5. $<$
6. $>$
7. 3
8. -4
9. 7
10. 8
11. 5
12. 1
13. $n + n + 2 + n + 4$
14. $\frac{1}{2}n + 12$
15. $2n - 32$
16. $3n + 2$
17. 3
18. $\frac{24}{5}$
19. $\frac{3}{2}$
20. 7
21. 24
22. $\frac{1}{2}$
23. 15
24. 1600

MINUTES

lank with $<$, $>$, or $=$ to
tatement true.

$2 < 3$
$5 > 4$
$3 > -1$
$5 = \frac{10}{2}$
$-4 \quad -7 < -4$
$-5 \quad -2 > -5$
$\frac{4}{7} > \frac{11}{21}$

H the Mathematics

ions of Inequalities

hat there can be infinitely
ions for an inequality.

tions

itement $0 \leq 0$ true? Yes
itement $0 \geq 0$ true? Yes
atement $-1 \geq 1$ true? No
atement $1 > 1$ true? No

ard Examples

mine whether each number is a
on of $x \leq 7$.
es, because $3 \leq 7$ is true.
Yes, because $-2 \leq 7$ is true.
lo, because $9 \leq 7$ is false.
'es, because $7 \leq 7$ is true.

aphing Inequalities

oard Examples

ph $x > 5$ on the number line.

solution is all points to the right
. Note that 5 is not included.

ph $x \leq -1$ on the number line.

solution is all points to the left of
. Note that -1 is included.

CA 1.0: Use arithmetic properties of integers.

4-1 Inequalities and Their Graphs

What You'll Learn

1. To determine whether a number is a solution of an inequality
2. To graph inequalities on the number line

. . . And Why

To understand statements of inequality

Math in Action

The phrases italicized below are statements of inequality. An inequality tells the relationship between two numbers or expressions.

- Motorized vehicles must be able to maintain a speed *greater than or equal to* 35 miles per hour to travel on most freeways.
- Most elevators can carry a load *less than or equal to* 2000 pounds.

PART 1 Solutions of Inequalities

Objective: Determine whether a given number is a solution of an inequality.

In Chapter Two you learned the meaning of the symbols $<$ (is less than) and $>$ (is greater than). We now include the symbols $\leq$ and $\geq$.

We read $\leq$ as "is less than or equal to."
We read $\geq$ as "is greater than or equal to."

Mathematical sentences containing $<$, $>$, $\leq$, or $\geq$ are called **inequalities.**

A solution of an inequality is any number that makes the inequality true.

EXAMPLE 1 Determine whether each number is a solution of $x \geq 5$.

5 Yes, 5 is a solution because $5 \geq 5$ is true.
12 Yes, 12 is a solution because $12 \geq 5$ is true.
-7 No, -7 is not a solution because $-7 \geq 5$ is not true.

Try This Determine whether the given number is a solution of the inequality.

a. $x < 3$ (1) 2 (2) 0 (3) -5 (4) 15 (5) 3
b. $x \geq 6$ (1) 6 (2) 0 (3) -4 (4) 25 (5) -6

Answers to page #173

PART 2 Graphing Inequalities

Objective: Graph inequalities on the number line.

A **graph** of an inequality in one variable is a picture of its solution set on a number line.

Try This

a. (1) Yes
(2) Yes
(3) Yes
(4) No
(5) No
b. (1) Yes
(2) No
(3) No
(4) Yes
(5) No
c.

d.

Exercises

1. a. No b. No
c. No d. Yes
2. a. Yes b. No
c. Yes d. Yes
3. a. No b. No
c. Yes d. Yes
4. a. Yes b. Yes
c. Yes d. No
5. a. No b. No
c. Yes d. No
6. a. Yes b. No
c. Yes d. Yes
7. a. Yes b. Yes
c. Yes d. No
8. a. Yes b. Yes
c. No d. Yes

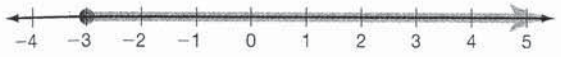
EXAMPLE 2 Graph $x < 2$ on a number line.

The solutions of $x < 2$ are all numbers less than 2. They are shown by shading all points to the left of 2 on a number line.

Note that 2 is not a solution. We indicate this by an open circle at 2. The red arrow indicates that all points to the left of 2 are solutions of the inequality.

EXAMPLE 3 Graph $x \geq -3$ on a number line.

The solutions of $x \geq -3$ are -3 and all points to the right of -3.



Note that -3 is a solution. We indicate this by a closed circle at -3. The red arrow indicates that all points to the right are also solutions of the inequality.

Try This Graph on a number line.

c. $x < 8$ **d.** $y \geq -5$

4-1 Exercises

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

A

Mental Math Determine whether the given number is a solution of the inequality.

1. $x > 4$	**a.** 4	**b.** 0	**c.** -4	**d.** 6
2. $y < 5$	**a.** 0	**b.** 5	**c.** -1	**d.** -5
3. $x \geq 6$	**a.** -6	**b.** 0	**c.** 6	**d.** 8
4. $x \leq 10$	**a.** 4	**b.** -10	**c.** 0	**d.** 11
5. $x < -8$	**a.** 0	**b.** -8	**c.** -9	**d.** -7
6. $x \geq 0$	**a.** 2	**b.** -3	**c.** 0	**d.** 3
7. $y \geq -5$	**a.** 0	**b.** -4	**c.** -5	**d.** -6
8. $y \leq -\frac{1}{2}$	**a.** -1	**b.** $-\frac{2}{3}$	**c.** 0	**d.** -0.5

Graph on a number line.

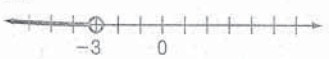
9. $x < 5$	**10.** $y < 0$	**11.** $t < -3$	**12.** $h < -5$
13. $y > 6$	**14.** $m > 4$	**15.** $k \geq -4$	**16.** $n \geq -2$
17. $x \leq 5$	**18.** $g \leq 8$	**19.** $b \leq -3$	**20.** $c \leq -1$

Answers on page #172

Exercises

9.


10.


11.


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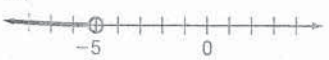


13.


14.


15.


16.


17.


18.


19.


20.


Teach the Mathematics (con

Use Teaching Transparencies T14 an to illustrate graphs of inequalities.

LESSON ENRICHMENT

True or false. Assume that x, y, and rational numbers.

a. $x < x$ False

b. If $x < y$ then $x \leq y$. True

c. If $x < y$, then there is some z suc $x < z$ and $z < y$.
True. This says there is some z be x and y.

d. For any x, there is a y such that y
True. This says that there is alwa bigger number y.

3. PRACTICE/ASSESS

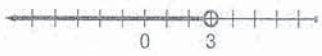
LESSON QUIZ

Determine whether each given nun a solution of the inequality.

1. $y \leq 4$ a. 4 b. 0 c. 8
Yes, yes, no

2. $a > -1$ a. 5 b. 0 c. -1
Yes, yes, no

Graph on a number line.

3. $x < 3$


4. $z \geq -2$


Assignment Guide

To provide flexible scheduling, t lesson can be split into parts.

▼ Core 1–8, 21–24
Extension 32

▼ Core 9–20, 25–31
Extension 33–36

Use Mixed Review to maintain sk

See Exercise 25.

B

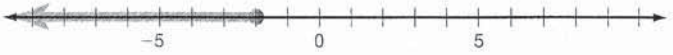
Classify each statement as true or false.

21. $3 \leq 3$ **22.** $\left|-\frac{1}{4}\right| \geq 0$ **23.** $|-10| \leq 4$ **24.** $|-.08| \leq 0.4$

25. Write an inequality for the sign at the left.

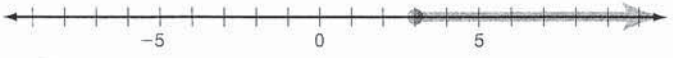
Write the inequality shown by each graph.

26.


27.


28.


29.


30.


31.


32. ***Critical Thinking*** The solutions to $|x| = 5$ are the same distance from 0. What can you say about the solutions to $|x - 2| = 5$?

Challenge

Graph on a number line.

33. all values of x such that $x < 3$ and $x > -1$

34. all values of x such that $x \geq 4$ and $x \leq 1$

35. all values of x such that $x > 2$ and $x < 5$

36. all values of x such that $|x| \geq 4$

Mixed Review

Solve. **37.** $\frac{1}{3} + 8m = 3m - \frac{1}{2}$ **38.** $5x - (2x + 7) = 2$

39. $7.5y - 0.5y = 3.75y + 39$ **40.** $16 - 2w = 10w - 2 - 6w$

41. $|y| + 6 = 21$ **42.** $|a| = |-9|$ **43.** $|x| = -6$ *3-5, 3-6, 3-8*

Write an equation to solve.

44. The perimeter of a rectangle is 30 in. The length is 5 in. greater than the width. Find the dimensions.

45. Maury bought concert tickets at the Ticket Outlet. He paid \$12 for each ticket, plus a \$5 service charge for the whole set of tickets. The total cost was \$77. How many tickets did he buy? *3-11*

Exercises

21. T
22. T
23. F
24. T
25. $s \leq 25$
26. $x \geq 2$
27. $x \leq -2$
28. $x < 4$
29. $x < 0$
30. $x \geq 3$
31. $x \leq 7$

32. The solutions to $|x - 2| = 5$ are symmetrically located about 2.

33.


34. No points meet requirements.

35.


36.

Mixed Review

37. $-\frac{1}{6}$
38. 3
39. 12
40. 3
41. ± 15
42. ± 9
43. No solution
44. 5 in., 10 in.
45. 6 tickets

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

4-2 Exercises

A

Solve each inequality and graph the solution.

1. $x + 7 > 2$
2. $x + 6 > 3$
3. $y + 5 > 8$
4. $y + 7 > 9$
5. $x + 8 \leq -10$
6. $x + 9 \leq -12$
7. $a + 12 < 6$
8. $a + 20 < 8$
9. $x - 7 \leq 9$
10. $x - 3 \leq 14$
11. $x - 6 > 2$
12. $x - 9 > 4$
13. $y - 7 > -12$
14. $y - 10 > -16$
15. $4m - 3m < 2$
16. $2x + 3 - x > 5$

Solve.

17. $3x - 2x + 9 \leq 6$
18. $-2y + 3y + 10 \leq 8$
19. $5n - 6 - 4n < -2$
20. $-5x + 6x - 8 < -9$
21. $3y + 4 - 2y \leq -7$
22. $4a - 3a + 5 \geq -8$
23. $m + \frac{1}{4} \leq \frac{1}{2}$
24. $y + \frac{1}{3} \geq \frac{5}{6}$
25. $x - \frac{1}{3} > \frac{1}{4}$
26. $b - \frac{1}{8} > \frac{1}{2}$
27. $c + \frac{4}{5} \leq \frac{3}{10}$
28. $\frac{2}{3} + a \geq \frac{5}{6}$

29. TEST PREP Which number is *not* a solution of $t - 5 \leq 1$?

A. -5 **B.** 1 **C.** 6 **D.** 10

B

Solve.

30. $3(r + 2) - 2r < 4$
31. $4(r + 5) - 3r \geq 7$
32. $3a + 6 - 2a \geq -19$
33. $-5 \leq 3m - 10 - 2m$
34. $4(x + 3) - 3x > 4$
35. $5(y - 2) - 4(y - 1) < 0$
36. $-6(a + 2) + 7a \leq -12$
37. $-2(a - 3) + 3(a + 2) < 4$

Use the first inequality to find the unknown number or expression in the second inequality.

38. $y + 2 + 3y > 9$
$y + 3y > ??$

39. $a^2 + 4 - b \leq -2$
$a^2 - b \leq ??$

40. $m + n - 4 \leq n$
$m - 4 \leq ??$

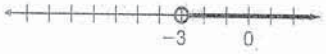
41. $p + q + z \geq -2$
$p + z \geq ??$

42. $a + b < 2a - 4$
$b < ??$

43. $x - y > 7 + y$
$x > ??$

Exercises

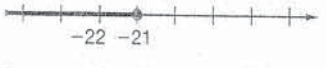
1. $x > -5$


2. $x > -3$


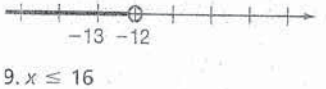
3. $y > 3$


4. $y > 2$

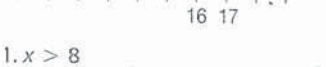

5. $x \leq -18$


6. $x \leq -21$


7. $a < -6$


8. $a < -12$


9. $x \leq 16$


0. $x \leq 17$


1. $x > 8$


2. $x > 13$


3. $y > -5$


14. $y > -6$


15. $m < 2$


16. $x > 2$


17. $x \leq -3$
18. $y \leq -2$
19. $n < 4$
20. $x < -1$
21. $y \leq -11$
22. $a \geq -13$
23. $m \leq \frac{1}{4}$
24. $y \geq \frac{1}{2}$
25. $x > \frac{7}{12}$
26. $b > \frac{5}{8}$
27. $c \leq -\frac{1}{2}$
28. $a \geq \frac{1}{6}$
29. D
30. $r < -2$
31. $r \geq -13$
32. $a \geq -25$
33. $m \geq 5$
34. $x > -8$
35. $y < 6$
36. $a \leq 0$
37. $a < -8$
38. 7
39. -6
40. 0
41. $-2 - q$
42. $a - 4$
43. $7 + 2y$

44. ***Error Analysis*** A student solved $t + 6 < 5$ and got the solution $t < 11$. What error did the student make?

45. ***Critical Thinking*** Give two different inequalities that each have $x \leq -5$ as a statement of all solutions.

Challenge

Determine whether the following statements are true or false.

46. $x + c < y + d$ when $x < y$ and $c < d$.

47. $x - c > y - d$ when $x > y$ and $c > d$.

48. If x is an integer, write a statement equivalent to $x > 5$ using $\geq$.

49. If y is an integer, write a statement equivalent to $y < 5$ using $\leq$.

50. ***Mathematical Reasoning*** Does the transitive property hold for $>$? Does it hold for $\leq$? Explain.

51. Other inequality symbols include $\not>$, which means "is not greater than," $\not<$, "is not less than," and $\neq$, "is not equal to." Write statements equivalent to each of the following using $>$, $<$, $\geq$, $\leq$, or $=$.

a. $x \not> 5$ **b.** $x \not< -3$ **c.** $x \neq -\frac{3}{2}$

d. $x \not< y$ **e.** $x \not> -y$ **f.** $-x \neq y$

Mixed Review

Solve each proportion. **52.** $\frac{m}{8} = \frac{3}{4}$ **53.** $\frac{21}{m} = \frac{7}{3}$ **54.** $\frac{4}{6} = \frac{m}{9}$ *3-9*

Solve. **55.** $-84x = 4$ **56.** $-3 = 9c$ **57.** $|t| - 4 = 21$

58. $3 - |m| = 1$ **59.** $\frac{2}{3} + \frac{1}{8}m = \frac{5}{12}m - \frac{19}{24}$ **60.** $\frac{2}{3} \cdot |y| = 8$ *3-2, 3-6, 3-8*

61. Write an algebraic expression for 3 more than twice a number. *1-6, 3-4*

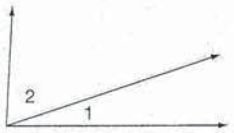
62. A certain cruise ship must have 1 lifeboat for every 16 passengers. How many lifeboats are needed to accommodate 144 passengers? *3-11*

63. A certain mixed-nut snack uses 6 oz of peanuts for every 4 oz of almonds and cashews. How many ounces of peanuts are needed for a 28 oz mix of almonds and cashews? *3-11*

Suppose peanuts cost \$2.50/lb, almonds cost \$5.60/lb, and cashews cost \$7.60/lb. A 1-lb mixture has 8 oz of peanuts, 4 oz of almonds, and 4 oz of cashews. How much should the 1-lb mixture cost?

Connections: Geometry

In the figure at the right, the measure of angle 1 is x ($m\angle 1 = x$) and the measure of angle 2 is $4x + 6$ ($m\angle 2 = 4x + 6$). The sum of the measures of angles 1 and 2 is less than 90°. What are three possible measures for angles 1 and 2?



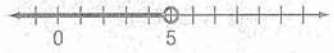
3. PRACTICE/ASSESS

LESSON QUIZ

Solve and graph the solution set.

1. $x + 3 < 8$

$x < 5$



2. $z - 4 \leq 3$

$z \leq 7$

Solve.

3. $6m - 7 - 5m \geq 3$

$m \geq 10$

4. $y + \frac{2}{3} \leq \frac{1}{6}$

$y \leq -\frac{1}{2}$

Assignment Guide

Core 1–44, 48, 49
Extension 45–47, 50, 51

Use Mixed Review to maintain sk

44. The student subtracted 6 from the left side, but added 6 to the right side.

45. Answers may vary. Example: $x + 7 \leq 2$, $2x - 6 \leq -16$

46. True

47. False

48. $x \geq 6$

49. $y \leq 4$

50. Yes, if $a > b$ and $b > c$, $a > c$; Yes, if $a \leq b$ and $b \leq c$, $a \leq c$.

51. a. $x \leq 5$

b. $x \geq -3$

c. $x < \frac{-3}{2}$ or $x > \frac{-3}{2}$

d. $x \geq y$

e. $x \leq -y$

f. $-x > y$ or $-x < y$

Mixed Review

52. 6

53. 9

54. 6

55. $-\frac{1}{21}$

56. $-\frac{1}{3}$

57. ± 25

58. ± 2

59. 5

60. ± 12

61. $2x + 3$

62. 9 lifeboats

63. 42 oz of peanuts

Photo Caption

\$4.55

Connections: Geometry

Answers may vary. Possible answers are $m\angle 1 = 16$, $m\angle 2 = 70$; $m\angle 1 = 15$, $m\angle 2 = 66$; $m\angle 1 = 10$, $m\angle 2 = 46$

. $-7q > -14$
$q < 2$

Assignment Guide
Core 1–43
Extension 44–46

Use Mixed Review to maintain skills.

Page 658-663

ercises

5. See Additional Answers for graphs.
$x < 7$
$x \geq 4$
$y \leq 9$
$x > 24$
$y > 12$
$x \leq 7$
$x < \frac{13}{7}$
$y < \frac{17}{8}$
$y \geq \frac{15}{4}$
$y \geq \frac{19}{3}$
$y \leq \frac{1}{2}$
$x \leq \frac{2}{7}$
$y \geq -3$
$x \geq -3$
$x < -3$
$y < -4$
$y \geq -\frac{2}{5}$
$x \geq -\frac{4}{7}$
$x \geq -6$
$y \geq -5$
$y \geq -4$
$y \geq -3$
$y < -60$
$x < -60$
$x > 2$
$y > 5$
$y \leq 2$

Extra Help On the Web
Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

4-3 Exercises

A

Solve each inequality and graph the solution.

1. $5x < 35$
2. $8x \geq 32$
3. $9y \leq 81$
4. $10x > 240$
5. $6y > 72$
6. $9x \leq 63$
7. $7x < 13$
8. $8y < 17$
9. $4y \geq 15$
10. $3y \geq 19$
11. $6y \leq 3$
12. $14x \leq 4$
13. $7y \geq -21$
14. $6x \geq -18$
15. $12x < -36$

Solve.

16. $16y < -64$
17. $5y \geq -2$
18. $7x \geq -4$
19. $-2x \leq 12$
20. $-3y \leq 15$
21. $-4y \leq 16$
22. $-7y \leq 21$
23. $-6y > 360$
24. $-9x > 540$
25. $-12x < -24$
26. $-14y < -70$
27. $-18y \geq -36$
28. $-20x \geq -400$
29. $-2x < -17$
30. $-5y < -23$
31. $-8y \geq -31$
32. $-7x \geq -43$
33. $-3y < \frac{1}{7}$

34. ***Error Analysis*** A student wrote that the solution of $-2x \geq 20$ was $x \geq -10$. What error did the student make?

B

Solve.

35. $-7x \geq -6.3$
36. $-\frac{5}{6}y \leq -\frac{3}{4}$
37. $-8x < 40.5$
38. $-\frac{3}{4}x \geq -\frac{1}{8}$
39. $5x + 6x < -33$
40. $-12 > 2y - 6y$
41. $0 > -5t + 10t$
42. $4 \leq -9n + n$
43. $4m - 9m \geq -12 - 8$
44. ***Critical Thinking*** Solve $3x > 4x$.

Challenge

Mathematical Reasoning Determine whether each statement is true or false. If it is false, give a counterexample.

45. $x^2 > y^2$ when $x > y$.
46. $\frac{x}{z} < \frac{y}{z}$ when $x < y$ and $z \neq 0$.

Self-Test On the Web
Check your progress. Look for a self-test at the Prentice Hall Web site.
www.phschool.com

Mixed Review

Determine whether the given number is a solution of the inequality.

47. $-4x > 9$ **a.** 10 **b.** 6 **c.** -8 **d.** 0 **e.** -5 *4-1*

Simplify.

48. $4m + 2m - m$
49. $7x + 5 + 4x$
50. $6(y + 4y) + 3y$
51. $3(2x - 4) + 2x + 12$ *1-5, 2-7*

Evaluate for $a = 2, b = 3, c = 4$.

52. $a(b^2 + c)$
53. $c(2a - 3b)$ *1-1, 2-7*

28. $x \leq 20$
29. $x > \frac{17}{2}$
30. $y > \frac{23}{5}$
31. $y \leq \frac{31}{8}$
32. $x \leq \frac{43}{7}$
33. $y > -\frac{1}{21}$
34. The student forgot to reverse the inequality symbol when multiplying both sides by a negative number.
35. $x \leq 0.9$
36. $y \geq \frac{9}{10}$
37. $x > -5.0625$
38. $x \leq \frac{1}{6}$
39. $x < -3$
40. $y > 3$
41. $t < 0$
42. $n \leq -\frac{1}{2}$
43. $m \leq 4$
44. $x < 0$
45. False; $-2 > -3$ but $4 < 9$.
46. False; $6 < 10$ but $\frac{6}{-2} > \frac{10}{-2}$.

Mixed Review

47. a. No
b. No
c. Yes
d. No
e. Yes
48. $5m$
49. $11x + 5$
50. $33y$
51. $8x$
52. 26
53. -20

Teach the Mathematics (continued)

$+ 7 - x + 1 < 2x + 4$
$-7x + 8 < 2x + 4$
$+ 8 - 8 < 2x + 4 - 8$
$-7x < 2x - 4$
$7x - 2x < 2x - 2x - 4$
$-9x < -4$
$\frac{1}{9}(-9x) > -\frac{1}{9}(-4)$
$x > \frac{4}{9}$

ACTICE/ASSESS

QUIZ

$2x > 19$
$19 - 7$
12
$\frac{12}{2}$
6
$7 \geq 2z + 3$
$4z \geq 2z + 3 + 7$
$4z \geq 2z + 10$
$2z \geq 2z - 2z + 10$
$2z \geq 10$
$z \geq \frac{10}{2}$
$z \geq 5$
$> 2w + 13$
$- 2w > 13$
$-9w > 13$
$w < \frac{13}{-9}$
$w < -\frac{13}{9}$

ignment Guide
ore 1–59
tension 60–69

Mixed Review to maintain skills.

Extra Help On the Web
Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

4-4 Exercises

A

Solve.

1. $4 + 3x < 28$
2. $5 + 4y < 37$
3. $3x - 5 \leq 13$
4. $5y - 9 \leq 21$
5. $13x - 7 < -46$
6. $8y - 4 < -52$
7. $5x + 3 \geq -7$
8. $7y + 4 \geq -10$
9. $4 - 3y > 13$
10. $6 - 8x > 22$
11. $3 - 9x < 30$
12. $5 - 7y < 40$
13. $3 - 6y > 23$
14. $8 - 2y > 14$
15. $4x + 2 - 3x \leq 9$
16. $15x + 3 - 14x \leq 7$
17. $8x + 7 - 7x > -3$
18. $9x + 8 - 8x > -5$
19. $6 - 4y > 4 - 3y$
20. $7 - 8y > 5 - 7y$
21. $5 - 9y \leq 2 - 8y$
22. $6 - 13y \leq 4 - 12y$
23. $19 - 7y - 3y < 39$
24. $18 - 6y - 9y < 63$
25. $21 - 8y < 6y + 49$
26. $33 - 12x < 4x + 97$
27. $14 - 5y - 2y \geq -19$
28. $17 - 6y - 7y \leq -13$
29. $27 - 11x > 14x - 18$
30. $42 - 13y > 15y - 19$

31. **TEST PREP** Which inequality has the same solutions as $3x - 1 > -7$?

A. $-2x + 4 > 8$ **B.** $x + 3 - 2x > 5$ **C.** $4x < 6x + 4$
D. $9 + 4x \geq 1$ **E.** None of them

B

Solve.

32. $5(12 - 3t) \geq 15(t + 4)$
33. $6(z - 5) < 5(7 - 2z)$
34. $4(0.5 - y) + y > 4y - 0.2$
35. $3 + 3(0.6 + y) > 2y + 6.6$
36. $\frac{x}{3} - 2 \leq 1$
37. $\frac{2}{3} - \frac{x}{5} < \frac{4}{15}$
38. $\frac{y}{5} + 1 \leq \frac{2}{5}$
39. $\frac{3x}{5} \geq -15$
40. $\frac{-x}{4} - \frac{3x}{8} + 2 > 3 - x$
41. $11 - x > 5 + \frac{2x}{5}$
42. $0.2y + 2.1 \geq 1.2y + 0.3$
43. $0.3b + 5.4 \geq -b + 0.2$
44. $0.2(30 + a) < 5$
45. $0.3(10 + 2y) \leq 9$
46. $\frac{1}{5}(z + 6) \leq 0.4(2 + z)$
47. $\frac{1}{2}(t + 5) \leq 0.2(3 + t)$
48. $\frac{1}{2}(c + 3) - \frac{1}{3}(c - 2) > 0$
49. $\frac{3}{4}(2d + 1) + \frac{1}{3}(d - 3) < 0$
50. $0.3[4(x - 2) + x] < 0.3x$
51. $0.4[2(w + 3) - 5w] < 0.6$

Exercises

1. $x < 8$
2. $y < 8$
3. $x \leq 6$
4. $y \leq 6$
5. $x < -3$
6. $y < -6$
7. $x \geq -2$
8. $y \geq -2$
9. $y < -3$
10. $x < -2$
11. $x > -3$
12. $y > -5$
13. $y < -\frac{10}{3}$
14. $y < -3$
15. $x \leq 7$
16. $x \leq 4$
17. $x > -10$
18. $x > -13$
19. $y < 2$
20. $y < 2$
21. $y \geq 3$
22. $y \geq 2$
23. $y > -2$
24. $y > -3$
25. $y > -2$
26. $x > -4$
27. $y \leq \frac{33}{7}$
28. $y \geq \frac{30}{13}$
29. $x < \frac{9}{5}$
30. $y < \frac{61}{28}$
31. C
32. $t \leq 0$
33. $z < \frac{65}{16}$
34. $y < \frac{2.2}{7}$
35. $y > 1.8$
36. $x \leq 9$
37. $x > 2$
38. $y \leq -3$
39. $x \geq -25$
40. $x > \frac{8}{3}$
41. $x < \frac{30}{7}$
42. $1.8 \geq y$
43. $b \geq -4$
44. $a < -5$
45. $y \leq 10$
46. $2 \leq z$
47. $t \leq -\frac{19}{3}$
48. $c > -13$

Mathematical Reasoning Give a reason that justifies each step in the solution.

52. $8 + 3x - 7x \geq 32$

a. $8 - 4x \geq 32$ _____

b. $-8 + 8 - 4x \geq 32 - 8$ _____

c. $-4x \geq 24$ _____

d. $-\frac{1}{4}(-4x) \leq -\frac{1}{4} \cdot 24$ _____

e. $x \leq -6$ _____

53. $11 - 6y < -34 + 9y$

a. $11 - 6y + 6y < -34 + 9y + 6y$ _____

b. $11 < -34 + 15y$ _____

c. $34 + 11 < 34 - 34 + 15y$ _____

d. $45 < 15y$ _____

e. $\frac{1}{15} \cdot 45 < \frac{1}{15} \cdot 15y$ _____

f. $3 < y$ _____

54. $3(m - 8) \geq 4(m + 4)$

a. $3m - 24 \geq 4m + 16$ _____

b. $3m - 24 + 24 \geq 4m + 16 + 24$ _____

c. $3m \geq 4m + 40$ _____

d. $-4m + 3m \geq -4m + 4m + 40$ _____

e. $-m \geq 40$ _____

f. $-1(-m) \leq -1 \cdot 40$ _____

g. $m \leq -40$ _____

55. $\frac{x}{4} - \frac{1}{6} \leq \frac{2}{3}$

a. $12\left(\frac{x}{4} - \frac{1}{6}\right) \leq 12\left(\frac{2}{3}\right)$ _____

b. $12\left(\frac{x}{4}\right) - 12\left(\frac{1}{6}\right) \leq 12\left(\frac{2}{3}\right)$ _____

c. $3x - 2 \leq 8$ _____

d. $3x - 2 + 2 \leq 8 + 2$ _____

e. $3x \leq 10$ _____

f. $\frac{1}{3}(3x) \leq \frac{1}{3}(10)$ _____

g. $x \leq \frac{10}{3}$ _____

49. $d < \frac{3}{22}$
50. $x < 2$
51. $w > 1.5$
52. a. Simplifying
    b. Using the addition property
    c. Simplifying
    d. Using the multiplication property
    e. Simplifying
53. a. Using the addition property
    b. Simplifying
    c. Using the addition property
    d. Simplifying
    e. Using the multiplication property
    f. Simplifying
54. a. Using the distributive property
    b. Using the addition property
    c. Simplifying
    d. Using the addition property
    e. Simplifying
    f. Using the multiplication property
    g. Simplifying
55. a. Using the multiplication property
    b. Using the distributive property
    c. Simplifying
    d. Using the addition property
    e. Simplifying
    f. Using the multiplication property
    g. Simplifying

Determine whether each inequality is sometimes, always, or never true for any value of the variable.

56. $w + 3 \leq w - 4$ **57.** $2t < 5t$ **58.** $x^2 > x$

59. ***Error Analysis*** A student solved the inequality $4x + 9 < 7x - 1$ as shown below.

$$4x + 9 < 7x - 1$$
$$8 < 3x$$
$$\frac{8}{3} < x$$

What error did the student make?

60. ***Critical Thinking*** Solve $\frac{1}{2}(5x + 5) < \frac{1}{3}(5x - 30)$ and describe its positive solutions.

Challenge

Solve for x.

61. $-(x + 5) \geq 4a - 5$ **62.** $\frac{1}{2}(2x + 2b) > \frac{1}{3}(21 + 3b)$

63. $-6(x + 3) \leq -9(y + 2)$ **64.** $y < ax + b$

65. $6x + 3 > 7x - c$ **66.** $8 - 0.5x < w + 6.7$

67. ***Mathematical Reasoning*** If $x \geq y$ and $-x \geq -y$, what can we conclude about x and y?

68. If $0 < x < 1$, then which of the following is true, $x^2 < x$ or $x < x^2$?

69. If $-1 < x < 0$, then which of the following is true, $x^2 < |x|$ or $|x| < x^2$?

Mixed Review

Evaluate for $m = 6$. **70.** $m(m + 2)$ **71.** $0.5(m)$

72. $(m + 3)(m - 4)$ **73.** $m^2 - m - 12$ *1-1*

Solve. **74.** $9y = 3y - 45$ **75.** $3z + 45 < 36$

76. $-2.05n = -9.02$ **77.** $2x = 3x - 4$ *3-3, 3-5, 3-6*

Write each as a percent. **78.** $\frac{6}{8}$ **79.** $\frac{27}{15}$ **80.** $\frac{60}{12}$ **81.** $\frac{45}{75}$ **82.** $\frac{18}{4}$ *3-10*

83. Let M be Michele's age. Nicole is 2 years younger than Michele. Write an expression for Nicole's age.

84. Let s be the total amount Heidi spent for scarves. Each of the 4 scarves that she bought cost the same. Write an expression for the cost of each scarf.

85. Let L be the amount Lewis earns. Harry earns three times as much as Lewis. Write an expression for the amount Harry earns. *1-6*

xercises

5. Never
7. Sometimes
3. Sometimes
9. In the second line the student added 1 to the right side, but subtracted 1 from the left side.

60. $x < -15$. There are no positive solutions.
61. $x \leq -4a$
62. $x > 7$
63. $x \geq \frac{3y}{2}$
64. $x > \frac{y - b}{a}$ if $a > 0$

    $x < \frac{y - b}{a}$ if $a < 0$
65. $x < c + 3$
66. $x > -2w + 2.6$
67. $x \geq y$ and $x \leq y$, so $x = y$
68. $x^2 < x$
69. $x^2 < |x|$

Mixed Review

70. 48
71. 3
72. 18
73. 18
74. -7.5
75. $z < -3$
76. 4.4
77. 4
78. 75%
79. 180%
80. 500%
81. 60%
82. 450%
83. $M - 2$
84. $\frac{s}{4}$
85. $3L$

EXAMPLE 8

ıe medium-size box of dog food weighs 1 lb more than the small size. The rge size weighs 2 lb more than the small size. If the total weight of the three ɔxes is at most 30 lb, what is the most a small box could weigh?

UNDERSTAND the problem

Question: What is the most the small box could weigh?
Data: Medium box weighs 1 lb more than the small;
large box weighs 2 lb more than the small;
total weight of the three boxes is at most 30 lb.

Develop and carry out a PLAN

Let s = the maximum weight of the small box.
$s + 1$ = the maximum weight of the medium box.
$s + 2$ = the maximum weight of the large box.

$s + (s + 1) + (s + 2) \leq 30$ The total weight of the 3 boxes is 30 lb or less.
$3s + 3 \leq 30$ Simplifying
$3s \leq 27$ Adding -3 to both sides
$s \leq 9$ Multiplying both sides by $\frac{1}{3}$

Find the ANSWER and CHECK

The small box can weigh at most 9 lb. We know that $3 \times 10 = 30$, so we can estimate that each box should weigh about 10 lb. The answer is reasonable.

Try This

f. Each student agreed to sell at least 50 seed packages for a school project. Yesterday one student sold 22 packages, and today this student sold 18. How many more packages does the student need to sell to reach the goal of 50 packages?

g. In an algebra course you must get a total of at least 360 points on four tests for a grade of A. You get 85, 89, and 92 on the first three tests. What score on the last test will give you an A?

h. The sum of two consecutive integers is less than 35. What is the greatest possible pair?

4-5 Exercises

Extra Help On the Web

Look for worked-out examples at the Prentice Hall Web site.
www.phschool.com

A

Translate to an inequality.

1. 3 is less than a number y.
2. $5\frac{1}{2}$ is greater than a number k.
3. A number h is at least $4\frac{5}{6}$.
4. A number j is at most 2.

Try This

f. $p \geq 10$; at least 10 packages
g. $s \geq 94$; at least 94 points
h. 16, 17

Exercises

1. $y > 3$
2. $k < 5\frac{1}{2}$
3. $h \geq 4\frac{5}{6}$
4. $j \leq 2$

3. PRACTICE/ASSESS

LESSON QUIZ

Write an expression for each statement.

1. x is greater than 3.
   $x > 3$
2. The number x is as least as great as th number y.
   $x \geq y$
3. Twice the number n, plus 1, is greate than 7.
   $2n + 1 > 7$

Solve.

4. The sum of two integers is greater than 20. The second number is three times as large as the first number. Fin the range of the first number.
   Let n be the first number. The second number is $3n$. The sum of the numbe is greater than 20.
   $n + 3n > 20$
   $4n > 20$
   $n > 5$

Assignment Guide

To provide flexible scheduling, this lesson can be split into parts.

- Core 1–14
  Extension 26, 27
- Core 15–25
  Extension 28–30

Use Mixed Review to maintain skills.

5. A number is greater than or equal to 0.
6. 7 less than a number is less than 5.
7. 2 more than a number is greater than 9.
8. Twice a number is greater than 12.
9. Half a number is less than or equal to 6.
10. 3 more than one third of a number is less than 9.
11. 18 is greater than or equal to 4 less than twice a number.
12. 4 more than twice a number is less than the opposite of the number.
13. 2 more than the quantity 3 times a number is at most 11.
14. 5 less than a third of a number is at most 15.

Solve.

15. Your quiz grades are 73, 75, 89, and 91. What is the lowest grade you can obtain on the last quiz and still achieve an average of at least 85?
16. The sum of three consecutive odd integers is less than 100. What are the greatest possible values of these integers?
17. Find the greatest possible pair of integers such that one integer is twice the other and their sum is less than 30.
18. The sum of two integers is greater than 12. One integer is ten less than twice the other. What are the least values of the integers?
19. Find all sets of four consecutive even whole numbers whose sum is less than 35.
20. Find the length of the base of a triangle when one side is 2 cm shorter than the base and the other side is 3 cm longer than the base. The perimeter is greater than 19 cm.
21. Armando and Drew do volunteer work at an animal shelter. Drew worked 3 more hours than Armando, and together they worked more than 27 hours. What is the least number of hours each worked?
22. Mrs. Hays has promised her two teenagers that they may go to a concert if together they save more than $25.00 of their spending money. The older teenager agrees to save twice as much as the younger. How much must each save?

B

Solve.

23. The length of a rectangle is 26 cm. What width will make the perimeter greater than 80 cm?
24. The width of a rectangle is 8 cm. What length will make the area at least 150 cm^2?
25. The height of a triangle is 20 cm. What length base will make the area greater than 40 cm^2?

Exercises

5. $x \geq 0$
6. $x - 7 < 5$
7. $x + 2 > 9$
8. $2x > 12$
9. $\frac{x}{2} \leq 6$
10. $\frac{x}{3} + 3 < 9$
11. $2x - 4 \leq 18$
12. $2x + 4 < -x$
13. $3x + 2 \leq 11$
14. $\frac{x}{3} - 5 \leq 15$
15. 97
16. 31, 33, 35
17. 9, 18
18. 8, 6
19. 0, 2, 4, 6; 2, 4, 6, 8; 4, 6, 8, 10
20. $b > 6$ cm; the base is longer than 6 cm.
21. $A > 12$, $D > 15$; Armando worked more than 12 hours, and Drew worked more than 15 hours.
22. $16.68; $8.34
23. $w > 14$ cm
24. $l \geq 18.75$ cm
25. $b > 4$ cm

ranslate to an inequality and solve.

6. Half of a number is at least -8.
7. 7 less than a third of a number is less than 12.
8. ***Critical Thinking*** A painter can be paid in two ways.

   Plan A: \$500 plus \$19 per hour
   Plan B: \$24 per hour

   Suppose the job takes n hours. For what values of n is Plan A better for the painter than Plan B?

Challenge

9. You have 5 sections of chain and each section has 3 links. The cost to have a link cut is 10¢. The cost to have a link welded is 20¢. How can you join the sections together for less than \$1?
10. The Wilsons are remodeling their bathroom. A new vanity and sink will cost \$151, the mirror and lights will cost \$179.75, and a new tub with the vinyl behind it will cost \$191. The plumber will install everything and will charge a certain percent of the total cost of the material for his labor. What is the greatest percent the Wilsons can afford to pay to keep the total for material and labor less than \$1000?

Mixed Review

Evaluate for $n = \frac{2}{3}$. **31.** $n - \frac{3}{2}$ **32.** $\left(\frac{4}{5}\right)n$ **33.** $\frac{3}{5} - n$ *1-1, 2-4, 2-5*

Solve. **34.** $4(c + 3) = 14c - 3$ **35.** $9y + 16 = 3 - 4y$
36. $9 - 2x < -11$ **37.** $14a + 3 \leq 15a + 7$ *3-5, 4-4*

TEST PREP Compare the boxed quantity in column A with the boxed quantity in column B. Choose the best answer. *2-4, 3-2*

A. The quantity in column A is greater.
B. The quantity in column B is greater.
C. The two quantities are equal.
D. The relationship cannot be determined with the information supplied.

38.

column A	column B
$3x - 2$	$3x + 7$

40.

column A	column B
the solution of $4x = 25$	the solution of $-3z = -18$

39.

column A	column B
$-2x + 1$	$7x + 1$

41.

column A	column B
the solution of $\frac{m}{3} = \frac{5}{12}$	the solution of $\frac{c}{8} = \frac{4}{15}$

Exercises

26. $x \geq -16$
27. $x < 57$
28. $n < 100$
29. Cut all three links of one section (30¢). Use each link to join the remaining 4 sections, requiring 3 welds (60¢). The total cost will be 90¢.
30. 91.66%

Mixed Review

31. $-\frac{5}{6}$
32. $\frac{8}{15}$
33. $-\frac{1}{15}$
34. $\frac{3}{2}$
35. -1
36. $x > 10$
37. $a \geq -4$
38. B
39. D
40. A
41. B

4 Chapter Wrap Up

Key Terms

addition property of inequalities (p. 175)
conclusion (p. 192)
conditional statement (p. 192)
converse (p. 192)
graph (p. 172)
hypothesis (p. 192)
inequality (p. 172)
multiplication property of inequalities (p. 180)

4-1

A sentence containing $<$, $>$, $\leq$, or $\geq$ is an inequality. A solution of an **inequality** is any number that makes the inequality true when that number is substituted for the variable.

Determine whether the given number is a solution of the inequality.

1. $y \leq 4$ **a.** 3 **b.** 0 **c.** -2 **d.** 8

2. $x > -12$ **a.** 6 **b.** -18 **c.** 0 **d.** 18

A **graph** of an inequality is a diagram of all its solutions on a number line. A closed circle indicates that the end point is part of the solution, and an open circle indicates that the end point is not part of the solution.

Graph on a number line.

3. $x > -1$ **4.** $x \leq 5$ **5.** $x < -5$

4-2

The **addition property of inequalities** states that if we add the same number t both sides of an inequality, we get another inequality with the same solutions.

Solve and graph the solution.

6. $y + 5 > 3$ **7.** $b - \frac{1}{4} \geq 2$ **8.** $4a + 6 - 3a < 12$

Solve.

9. $4x + 6 - 3x > 2$ **10.** $a + \frac{2}{3} \leq \frac{5}{6}$ **11.** $-4y + 5y - 8 \leq 12$

4-3

The **multiplication property of inequalities** states that if we multiply both sides of an inequality by a positive number, we get another inequality with th same solutions. If, however, we multiply both sides of an inequality by a negative number, we must reverse the inequality symbol.

Solve and graph the solution.

12. $5x < 25$ **13.** $-3b \geq 21$ **14.** $-2y > 3$

4-4

The addition and multiplication properties are often used together in solving inequalities. The addition property is usually used first.

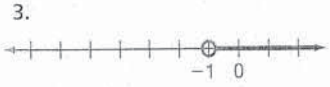
Solve.

15. $3y + 4 < 25$ **16.** $4a + 9 \leq 2a - 4$ **17.** $14 - 8x < 6x + 36$

18. $7 - 6y > 3y - 20$ **19.** $6 - 5y > 3 - 4y$ **20.** $15a + 3 - 12a \leq 14$

Chapter 4 Wrap Up

1. a. Yes
   b. Yes
   c. Yes
   d. No
2. a. Yes
   b. No
   c. Yes
   d. Yes

3. 

4. 

5. 

6. $y > -2$ 

7. $b \geq \frac{9}{4}$ 

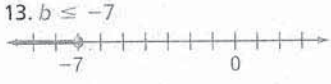
8. $a < 6$ 

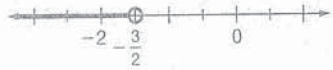
9. $x > -4$

10. $a \leq \frac{1}{6}$

11. $y \leq 20$

12. $x < 5$ 

13. $b \leq -7$ 

14. $y < -\frac{3}{2}$ 

15. $y < 7$

16. $a \leq -\frac{13}{2}$

17. $x > -\frac{11}{7}$

18. $y < 3$

19. $y < 3$

20. $a \leq \frac{11}{3}$

196 Chapter 4 *Inequalities*

4-5

Some problems can be solved by translating to an inequality and solving the inequality. Use the Problem-Solving Guidelines to help you.

Solve.

21. Alicia weighs 60 lb less than her father. Their combined weights total 300 lb at most. What is the most Alicia could weigh?

22. Heather received grades of 80, 75, and 86 on three algebra tests. What must her grade be on the next test if her average for the four tests is to be at least 82?

23. The sum of three consecutive even integers is less than or equal to 42. Find the largest set of these numbers.

24. Find all sets of four consecutive odd whole numbers whose sum is less than 38.

Look for extension problems for this chapter at the Prentice Hall Web site.
www.phschool.com

Assessment Item Analysis

Item	Lesson
1–5	4-1
6	4-2
7	4-4
8	4-2
9, 10	4-3
11–17	4-4
18, 19	4-5

Chapter Assessment

1. Determine whether each number is a solution of $b \geq -3$.

a. 0 **b.** -3 **c.** -5 **d.** 6

2. Determine whether each number is a solution of $x < 5$.

a. 3 **b.** -3 **c.** -8 **d.** 0

Graph on a number line.

3. $a \geq -5$ **4.** $c < -4$ **5.** $y \leq 6$

Solve.

6. $x - 2 > 5$

7. $9x + 2 - 4x > 17$

8. $x + \frac{1}{3} \geq -5$

9. $7y > -42$

10. $-6x \leq -24$

11. $5x \geq 8x - \frac{3}{2}$

12. $5a - 6 \geq 3a$

13. $2x - 15 > 5x$

14. $-5y - 34 \geq -19$

15. $7 - 6x < 2x + 87$

16. $5 - 8y \geq 23$

17. $9a - 16 < -52$

18. Kim is 3 years older than Bridget. The sum of their ages is less than 16. What is the oldest Bridget could be?

19. The sum of two consecutive even integers is less than or equal to 90. What is the greatest possible pair?

Chapter 4 Wrap Up

21. 120 lbs
22. $T \geq 87$
23. 12, 14, 16
24. 1, 3, 5, 7; 3, 5, 7, 9; 5, 7, 9, 11

Chapter 4 Assessment

1. a. Yes
   b. Yes
   c. No
   d. Yes
2. a. Yes
   b. Yes
   c. Yes
   d. Yes

3.

4.

5.

6. $x > 7$
7. $x > 3$
8. $x \geq -\frac{16}{3}$
9. $y > -6$
10. $x \geq 4$
11. $x \leq \frac{1}{2}$
12. $a \geq 3$
13. $x < -5$
14. $y \leq -3$
15. $x > -10$
16. $y \leq -\frac{9}{4}$
17. $a < -4$
18. $x < 6.5$; 6 years old
19. 44, 46

1–4 Cumulative Review

1-1

Evaluate.

1. $\frac{y - x}{4}$ for $y = 12$ and $x = 6$

2. $\frac{3x}{y}$ for $x = 5$ and $y = 4$

Simplify.

3. $16 \div (4 \cdot 2) + 9 - 3$

4. $(48 - 8) \div 5 + 3$

1-2

Write an equivalent expression using a commutative property or an identity property. Use $\frac{4}{4}$ for 1.

5. $12 + y$

6. $\frac{5}{6}$

Simplify.

7. $\frac{9xy}{12yz}$

8. $\frac{108}{72y}$

1-3

Evaluate each expression.

9. y^4 for $y = 2$

10. $x^3 + 5$ for $x = 3$

11. $(2a)^4$ for $a = 5$

12. $3a^2$ for $a = 2$

1-4

Calculate.

13. $(3 + 7)^3$

14. $5 + 4^4$

Use an associative property to write an equivalent expression.

15. $(3 \cdot y) \cdot z$

16. $x + (y + 21)$

1-5

Use the distributive property to write an equivalent expression.

17. $5(3x + 5y + 2z)$

18. $8(2w + 4x + 3y)$

Factor.

19. $54y + 6$

20. $42x + 36y + 12$

Collect like terms.

21. $9b + 18y + 6b + 4y$

22. $3y + 4z + 6z + 6y$

Chapters 1–4 Cumulative Review

1. $\frac{3}{2}$
2. $\frac{15}{4}$
3. 8
4. 11
5. $y + 12$
6. $\frac{20}{24}$
7. $\frac{3x}{4z}$
8. $\frac{3}{2y}$
9. 16
10. 32
11. 10,000
12. 12
13. 1000
14. 261
15. $3 \cdot (y \cdot z)$
16. $(x + y) + 21$
17. $15x + 25y + 10z$
18. $16w + 32x + 24y$
19. $6(9y + 1)$
20. $6(7x + 6y + 2)$
21. $15b + 22y$
22. $9y + 10z$

1-6

Write as an algebraic expression.

23. four less than twice w

24. three times the sum of x and y

1-7

Solve for the given replacement set.

25. $6y = 54$ $\{7, 8, 9\}$

26. $x^2 - x = 3$ $\{1, 3, 9\}$

27. $2.5y = 15$ $\{0.6, 6, 60\}$

28. $m - 18 = 56$ $\{38, 64, 74\}$

Each pair of equations is equivalent. What was done to the first equation to get the second one?

29. $\frac{4y}{7} = 3$
$4y = 21$

30. $5x = 30$
$5x - 4 = 26$

1-9

Evaluate.

31. Find the perimeter (p) of a rectangle with a length (l) of 12 m and a width (w) of 8.4 m using the formula $p = 2l + 2w$.

32. Find the area (A) of a rectangle with a length (l) of 12 m and a width (w) of 8.4 m using the formula $A = l \cdot w$.

2-1

Use $>$ or $<$ to write a true sentence.

33. $-4 \square -6$

34. $-2 \square 2$

Find the absolute values.

35. $|-14|$

36. $|65|$

2-2

Use $>$ or $<$ to write a true sentence.

37. $-2.5 \square -4.25$

38. $-\frac{3}{4} \square -\frac{3}{8}$

Graph each rational number on a number line.

39. -3.5

40. $\frac{5}{4}$

2-3

Add.

41. $5 + (-9) + 7$

42. $-3.5 + 7.2$

Chapters 1–4 Cumulative Review

23. $2w - 4$
24. $3(x + y)$
25. $\{9\}$
26. No solution
27. $\{6\}$
28. $\{74\}$
29. Both sides were multiplied by 7.
30. 4 was subtracted from both sides.
31. $p = 40.8$ m
32. $A = 100.8$ m^2
33. $>$
34. $<$
35. 14
36. 65
37. $>$
38. $<$
39. -3.5

40. $\frac{5}{4}$

41. 3
42. 3.7

2-4

Subtract.

43. $-7 - (-8)$ **44.** $-\frac{3}{4} - \frac{2}{3}$

Simplify.

45. $-2 - 4x - 6x + 5$ **46.** $7 - 2x - (-5x) - 8$

2-5

Multiply.

47. $5(-7)(3)(-4)$ **48.** $-\frac{5}{8}\left(-\frac{4}{3}\right)$ **49.** $(-7)(5)(-6)(-0.5)$

2-6

Divide.

50. $\frac{-10.8}{36}$ **51.** $\frac{-4}{5} \div \frac{25}{8}$ **52.** $\frac{81}{-90}$

2-7

Multiply.

53. $4(-3x - 2)$ **54.** $-6(2y - 4x)$ **55.** $-5(-x - 1)$

Factor.

56. $16y - 56$ **57.** $-2x - 8$ **58.** $5a - 15b + 25$

Collect like terms.

59. $-4d - 6a + 3a - 5d + 1$ **60.** $3.2x + 2.9y - 5.8x - 8.1y$

2-8

Remove parentheses and simplify.

61. $-3x - (-x + y)$ **62.** $-3(x - 2) - 4x$ **63.** $10 - 2(5 - 4x)$

2-10

Which properties of equality justify each statement?

64. $2a + 3b = 2a + 3b$

65. $60 = 45t$ and $60 = 35(t - 1)$. Therefore, $45t = 35(t - 1)$.

3-1 to 3-6

Solve.

66. $-2.6 + x = 8.3$ **67.** $4\frac{1}{2} + y = 8\frac{1}{3}$ **68.** $\frac{-3}{4}x = 36$

69. $-2.2y = -26.4$ **70.** $-4x + 3 = 15$ **71.** $-3x + 5 = -8x - 7$

Chapters 1–4 Cumulative Review

43. 1

44. $-\frac{17}{12}$

45. $3 - 10x$

46. $-1 + 3x$

47. 420

48. $\frac{5}{6}$

49. -105

50. -0.3

51. $-\frac{32}{125}$

52. $-\frac{9}{10}$

53. $-12x - 8$

54. $-12y + 24x$

55. $5x + 5$

56. $8(2y - 7)$

57. $-2(x + 4)$

58. $5(a - 3b + 5)$

59. $-9d - 3a + 1$

60. $-2.6x - 5.2y$

61. $-2x - y$

62. $-7x + 6$

63. $8x$

64. Reflexive property

65. Transitive property

66. 10.9

67. $3\frac{5}{6}$

68. -48

69. 12

70. -3

71. $-\frac{12}{5}$

72. $4y - 4 + y = 6y + 20 - 4y$ **73.** $-3(x - 2) = -15$

74. $\frac{1}{3}x - \frac{5}{6} = \frac{1}{2} + 2x$ **75.** $-3.7x + 6.2 = -7.3x - 5.8$

3-7

Solve.

76. $c = 10d + 5n$ for n **77.** $L = 2rh$ for r

3-8

Solve.

78. $|y| = 7$ **79.** $|x| + 2 = 11$ **80.** $3|a| = 27$

3-9

Solve.

81. $\frac{x}{12} = \frac{16}{18}$ **82.** $\frac{16}{6} = \frac{x}{24}$

83. A car uses 32 L of gas to travel 450 km. How many liters would be required to drive 800 km (to the nearest tenth)?

3-10

Translate to an equation and solve.

84. What percent of 60 is 18? **85.** Two is four percent of what number?

86. What is 16.5% of 80?

3-11

87. Money is invested in a savings account at 12% simple interest. After one year there is $1680 in the account. How much was originally invested?

88. The sum of three consecutive integers is 114. Find the integers.

4-1

Determine whether each number is a solution of $a \geq -4$.

89. -6 **90.** 2 **91.** 0 **92.** -4

4-2 to 4-5

Solve and graph on a number line.

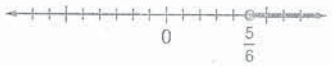
93. $x - \frac{1}{6} \geq \frac{2}{3}$ **94.** $-4x \geq 24$

95. $-3x < 30 + 2x$ **96.** $x + 3 \geq 6(x - 4) + 7$

97. Find the length and width of a rectangle when the width is 4 ft shorter than the length. The perimeter of the rectangle is greater than 72 ft.

Chapters 1–4 Cumulative Review

72. 8
73. 7
74. $-\frac{4}{5}$
75. $-3\frac{1}{3}$ or $-3.3\overline{3}$
76. $n = \frac{c - 10d}{5}$
77. $r = \frac{L}{2h}$
78. 7, −7
79. 9, −9
80. 9, −9
81. $\frac{32}{3}$
82. 64
83. 56.9 L
84. 30%
85. 50
86. 13.2
87. $1500
88. 37, 38, 39
89. No
90. Yes
91. Yes
92. Yes
93. $x \geq \frac{5}{6}$



94. $x \leq -6$

95. $x > -6$

96. $x \leq 4$

97. $l > 20$ ft, $w > 16$ ft