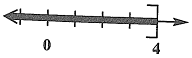
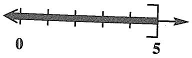
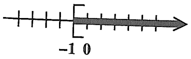
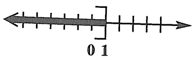
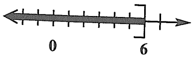
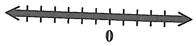
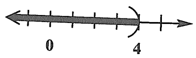
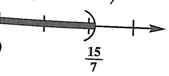
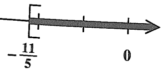
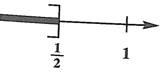
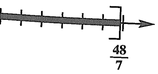
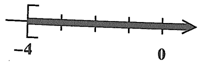
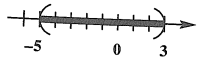
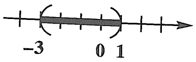
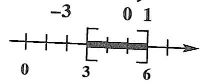
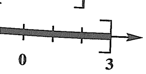
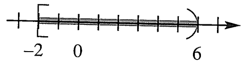
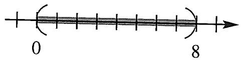
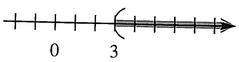
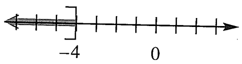
1.7 Exercises

1. F 2. J 3. A 4. H 5. I
6. D 7. B 8. G 9. E
10. C 12. D
13. $(-\infty, 4]$; 
14. $(-\infty, 5]$; 
15. $[-1, \infty)$; 
16. $(-\infty, 1]$; 
17. $(-\infty, 6]$; 
18. $(-\infty, \infty)$; 
19. $(-\infty, 4)$; 
$\left(-\infty, \frac{15}{7}\right)$; 
$\left[-\frac{11}{5}, \infty\right)$; 
$\left(-\infty, \frac{1}{2}\right]$; 
$\left(-\infty, \frac{48}{7}\right]$; 
$[-4, \infty)$; 
$(-5, 3)$; 
$(-3, 1)$; 
$3, 6]$; 
$\left(-\frac{3}{2}, 3\right]$; 
$, 6)$;

Concept Check *Match the inequality in each exercise in Column I with its equivalent interval notation in Column II.*

I

1. $x < -4$
2. $x \leq 4$
3. $-2 < x \leq 6$
4. $0 \leq x \leq 8$
5. $x \geq -3$
6. $4 \leq x$
7. 
8. 
9. 
10. 

II

A. $(-2, 6]$
B. $[-2, 6)$
C. $(-\infty, -4]$
D. $[4, \infty)$
E. $(3, \infty)$
F. $(-\infty, -4)$
G. $(0, 8)$
H. $[0, 8]$
I. $[-3, \infty)$
J. $(-\infty, 4]$

11. Explain how to determine whether to use a parenthesis or a square bracket when graphing the solution set of a linear inequality.

12. *Concept Check* The three-part inequality $a < x < b$ means "a is less than x and x is less than b." Which one of the following inequalities is not satisfied by some real number x?

A. $-3 < x < 5$ **B.** $0 < x < 4$
C. $-3 < x < -2$ **D.** $-7 < x < -10$

Solve each inequality. Write each solution set in interval notation, and graph it. See Examples 1 and 2.

13. $2x + 1 \leq 9$
14. $3x - 2 \leq 13$
15. $-3x - 2 \leq 1$
16. $-5x + 3 \geq -2$
17. $2(x + 5) + 1 \geq 5 + 3x$
18. $6x - (2x + 3) \geq 4x - 5$
19. $8x - 3x + 2 < 2(x + 7)$
20. $2 - 4x + 5(x - 1) < -6(x - 2)$
21. $\frac{4x + 7}{-3} \leq 2x + 5$
22. $\frac{2x - 5}{-8} \leq 1 - x$
23. $\frac{1}{3}x + \frac{2}{5}x - \frac{1}{2}(x + 3) \leq \frac{1}{10}$
24. $-\frac{2}{3}x - \frac{1}{6}x + \frac{2}{3}(x + 1) \leq \frac{4}{3}$

Solve each inequality. Write each solution set in interval notation, and graph it. See Example 3.

25. $-3 < 7 + 2x < 13$
26. $-4 < 5 + 3x < 8$
27. $10 \leq 2x + 4 \leq 16$
28. $-6 \leq 6x + 3 \leq 21$
29. $-10 > -3x + 2 > -16$
30. $4 > -6x + 5 > -1$
31. $-4 \leq \frac{x + 1}{2} \leq 5$
32. $-5 \leq \frac{x - 3}{3} \leq 1$

33. $-3 \le \dfrac{x-4}{-5} < 4$

34. $1 \le \dfrac{4x-5}{-2} < 9$

Break-Even Interval *Find all intervals where each product will at least break even. See Example 4.*

35. The cost to produce x units of picture frames is $C = 50x + 5000$, while the revenue is $R = 60x$.

36. The cost to produce x units of baseball caps is $C = 100x + 6000$, while the revenue is $R = 500x$.

37. The cost to produce x units of coffee cups is $C = 85x + 900$, while the revenue is $R = 105x$.

38. The cost to produce x units of briefcases is $C = 70x + 500$, while the revenue is $R = 60x$.

Solve each quadratic inequality. Write each solution set in interval notation. See Examples 5 and 6.

39. $x^2 - x - 6 > 0$

40. $x^2 - 7x + 10 > 0$

41. $2x^2 - 9x - 18 \le 0$

42. $3x^2 + x - 4 \le 0$

43. $x^2 + 4x + 6 \ge 3$

44. $x^2 + 6x + 16 < 8$

45. $x(x-1) \le 6$

46. $x(x+1) < 12$

47. $x^2 \le 9$

48. $x^2 > 16$

49. $x^2 + 5x - 2 < 0$

50. $4x^2 + 3x + 1 \le 0$

51. $x^2 - 2x \le 1$

52. $x^2 + 4x > -1$

53. *Concept Check* Which one of the following inequalities has solution set $(-\infty, \infty)$?

A. $(x+3)^2 \ge 0$ **B.** $(5x-6)^2 \le 0$
C. $(6x+4)^2 > 0$ **D.** $(8x-7)^2 < 0$

54. *Concept Check* Which one of the inequalities in Exercise 53 has solution set $\emptyset$?

Relating Concepts

For individual or collaborative investigation
(Exercises 55–58)

Inequalities that involve more than two factors, such as

$$(3x-4)(x+2)(x+6) \le 0,$$

can be solved using an extension of the method shown in Examples 5 and 6. ***Work Exercises 55–58 in order,*** *to see how the method is extended.*

55. Use the zero-factor property to solve $(3x-4)(x+2)(x+6) = 0$.

56. Plot the three solutions in Exercise 55 on a number line.

57. The number line from Exercise 56 should show four intervals formed by the three points. For each interval, choose a number from the interval and decide whether it satisfies the original inequality.

58. On a single number line, graph the intervals that satisfy the inequality, including endpoints. This is the graph of the solution set of the inequality. Write the solution set in interval notation.