4.5 Exercise Set

FOR EXTRA HELP MyMathLab MathXL PRACTICE WATCH DOWNLOAD READ REVIEW

Concept Reinforcement *In each of Exercises 1–6, match the phrase with the most appropriate choice from the column on the right.*

1. (e) A solution of a linear inequality
2. (c) The graph of a linear inequality
3. (d) The graph of a system of linear inequalities
4. (a) Often a convenient test point
5. (b) The name for the corners of a graph of a system of linear inequalities
6. (f) A dashed line

a) $(0, 0)$
b) Vertices
c) A half-plane
d) The intersection of two or more half-planes
e) An ordered pair that satisfies the inequality
f) Indicates the line is not part of the solution

Determine whether each ordered pair is a solution of the given inequality.

7. $(-4, 2)$; $2x + 3y < -1$ Yes
8. $(3, -6)$; $4x + 2y \le -2$ No
9. $(8, 14)$; $2y - 3x \ge 9$ No
10. $(5, 8)$; $3y - 5x \le 0$ Yes

Graph on a plane.

11. $y \ge \frac{1}{2}x$
12. $y \le 3x$
13. $y > x - 3$
14. $y < x + 3$
15. $y \le x + 5$
16. $y > x - 2$
17. $x - y \le 4$
18. $x + y < 4$
19. $2x + 3y > 6$
20. $3x + 4y \le 12$
21. $2y - x \le 4$
22. $2y - 3x > 6$
23. $2x - 2y \ge 8 + 2y$
24. $3x - 2 \le 5x + y$
25. $x > -2$
26. $x \ge 3$
27. $y \le 6$
28. $y < -1$
29. $-2 < y < 7$
30. $-4 < y < -1$
31. $-4 \le x \le 2$
32. $-3 \le y \le 4$
33. $0 \le y \le 3$
34. $0 \le x \le 6$

Answers to Exercises 11–60 are on pp. IA-10 and IA-11.

Graph using a graphing calculator.

35. $y > x + 3.5$
36. $7y \le 2x + 5$
37. $8x - 2y < 11$
38. $11x + 13y + 4 \ge 0$

Graph each system.

39. $y > x$, $y < -x + 3$
40. $y < x$, $y > -x + 1$
41. $y \le x$, $y \le 2x - 5$
42. $y \ge x$, $y \le -x + 4$
43. $y \le -3$, $x \ge -1$
44. $y \ge -3$, $x \ge 1$
45. $x > -4$, $y < -2x + 3$
46. $x < 3$, $y > -3x + 2$
47. $y \le 5$, $y \ge -x + 4$
48. $y \ge -2$, $y \ge x + 3$
49. $x + y \le 6$, $x - y \le 4$
50. $x + y < 1$, $x - y < 2$
51. $y + 3x > 0$, $y + 3x < 2$
52. $y - 2x \ge 1$, $y - 2x \le 3$

Graph each system of inequalities. Find the coordinates of any vertices formed.

53. $y \le 2x - 3$, $y \ge -2x + 1$, $x \le 5$
54. $2y - x \le 2$, $y - 3x \ge -4$, $y \ge -1$
55. $x + 2y \le 12$, $2x + y \le 12$, $x \ge 0$, $y \ge 0$
56. $x - y \le 2$, $x + 2y \ge 8$, $y \le 4$
57. $8x + 5y \le 40$, $x + 2y \le 8$, $x \ge 0$, $y \ge 0$
58. $4y - 3x \ge -12$, $4y + 3x \ge -36$, $y \le 0$, $x \le 0$
59. $y - x \ge 2$, $y - x \le 4$, $2 \le x \le 5$
60. $3x + 4y \ge 12$, $5x + 6y \le 30$, $1 \le x \le 3$

TW 61. Explain in your own words why a boundary line is drawn dashed for the symbols $<$ and $>$ and why it is drawn solid for the symbols $\le$ and $\ge$.

TW 62. When graphing linear inequalities, Ron makes a habit of always shading above the line when the symbol $\ge$ is used. Is this wise? Why or why not?

SKILL REVIEW

To prepare for Section 5.1, review evaluating and simplifying algebraic expressions (Sections 1.1, 1.2, and 1.3).

Evaluate.

63. $3x^3 - 5x^2 - 8x + 7$, for $x = -1$ [1.1], [1.2] 7

64. $t^3 + 6t^2 - 10$, for $t = 2$ [1.1] 22

Simplify. [1.2], [1.3]

65. $3(2t - 7) + 5(3t + 1)$ $21t - 16$

66. $6(5x + 1) + 8(3 - x)$ $22x + 30$

67. $(8t + 6) - (7t + 6)$ t

68. $(9x - 5) - (10 - 3x)$ $12x - 15$

69. $(2a - 3) - 4(a + 6)$ $-2a - 27$

70. $(w + 9) - 3(w - 1)$ $-2w + 12$

SYNTHESIS

TW **71.** Explain how a system of linear inequalities could have a solution set containing exactly one ordered pair.

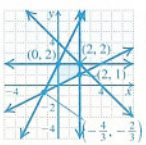
TW **72.** In Example 7, is the point $(4, 0)$ part of the solution set? Why or why not?

Graph.

73.
$$\begin{aligned} x + y &> 8, \\ x + y &\le -2 \end{aligned}$$ ⊡

74.
$$\begin{aligned} x + y &\ge 1, \\ -x + y &\ge 2, \\ x &\ge -2, \\ y &\ge 2, \\ y &\le 4, \\ x &\le 2 \end{aligned}$$ ⊡

75.
$$\begin{aligned} x - 2y &\le 0, \\ -2x + y &\le 2, \\ x &\le 2, \\ y &\le 2, \\ x + y &\le 4 \end{aligned}$$



76. Write four systems of four inequalities that describe a 2-unit by 2-unit square that has $(0, 0)$ as one of the vertices. ⊡

77. *Luggage Size.* Unless an additional fee is paid, most major airlines will not check any luggage for which the sum of the item's length, width, and height exceeds 62 in. The U.S. Postal Service will ship a package only if the sum of the package's length and girth (distance around its midsection) does not exceed 130 in. Video Promotions is ordering several 30-in. long cases that will be both mailed and checked as luggage. Using w and h for width and height (in inches), respectively, write and graph an inequality that represents all acceptable combinations of width and height. ⊡

Sources: U.S. Postal Service; www.case2go.com

78. *Hockey Wins and Losses.* The Skating Stars figure that they need at least 60 points for the season in order to make the playoffs. A win is worth 2 points and a tie is worth 1 point. Graph a system of inequalities that describes the situation. (*Hint*: Let w = the number of wins and t = the number of ties.) ⊡

79. *Waterfalls.* In order for a waterfall to be classified as a classical waterfall, its height must be no more than twice its crest width, and its crest width cannot exceed one-and-a-half times its height. The tallest waterfall in the world is about 3200 ft high. Let h represent a waterfall's height, in feet, and w the crest width, in feet. Write and graph a system of inequalities that represents all possible combinations of heights and crest widths of classical waterfalls. ⊡

80. *Widths of a Basketball Floor.* Sizes of basketball floors vary due to building sizes and other constraints such as cost. The length L is to be at most 94 ft and the width W is to be at most 50 ft. Graph a system of inequalities that describes the possible dimensions of a basketball floor. ⊡

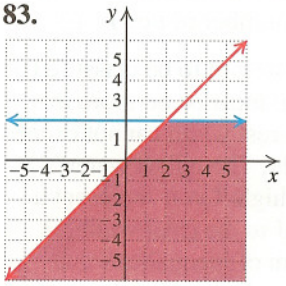
⊡ Answers to Exercises 73, 74, and 76–80 are on p. IA-11.

81. *Graduate-School Admissions.* Students entering the Master of Science program in Computer Science and Engineering at University of Texas Arlington must meet minimum score requirements on the Graduate Records Examination (GRE). The GRE Quantitative score must be at least 700 and the GRE Verbal score must be at least 400. The sum of the GRE Quantitative and Verbal scores must be at least 1150. Both scores have a maximum of 800. Using q for the quantitative score and v for the verbal score, write and graph a system of inequalities that represents all combinations that meet the requirements for entrance into the program. ⊡
Source: University of Texas Arlington

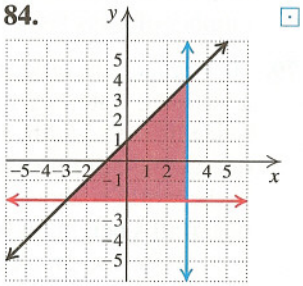
82. *Elevators.* Many elevators have a capacity of 1 metric ton (1000 kg). Suppose that c children, each weighing 35 kg, and a adults, each 75 kg, are on an elevator. Graph a system of inequalities that indicates when the elevator is overloaded. ⊡

Write a system of inequalities for each region shown.

83. ⊡

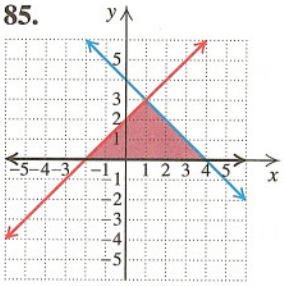


84. ⊡

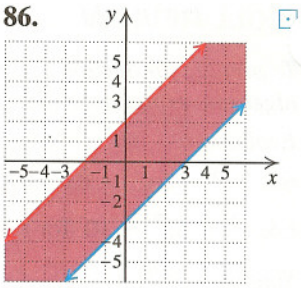


⊡ Answers to Exercises 81–86 are on p. IA-11.

85. ⊡



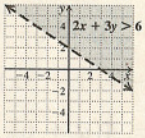
86. ⊡



Try Exercise Answers: Section 4.5

7. Yes **11.**

19.



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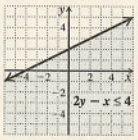

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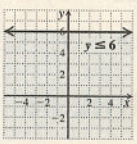

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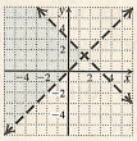

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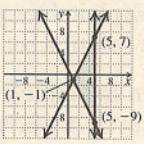

Collaborative Corner

How Old Is Old Enough?

Focus: Linear inequalities
Time: 15–25 minutes
Group Size: 2

It is not unusual for the ages of a bride and groom to differ significantly. Yet is it possible for the difference in age to be too great? In answer to this question, the following rule of thumb has emerged: *The younger spouse's age should be at least seven more than half the age of the older spouse.*
Source: http://home.earthlink.net/~mybrainhurts/2002_06_01_archive.html

ACTIVITY

1. Let b = the age of the bride, in years, and g = the age of the groom, in years. One group member should write an equation for calculating the bride's minimum age if the groom's age is known. The other group member should write an equation for finding the groom's minimum age if the bride's age is known. The equations should look similar.
2. Convert each equation into an inequality by selecting the appropriate symbol from $<$, $>$, $\leq$, and $\geq$. Be sure to reflect the rule of thumb stated above.
3. Graph both inequalities from step (2) as a system of linear inequalities. What does the solution set represent?
4. If your group feels that a minimum or maximum age for marriage should exist, adjust your graph accordingly.
5. Compare your finished graph with those of other groups.

1. $b = \frac{g}{2} + 7; g = \frac{b}{2} + 7$
2. $b \geq \frac{g}{2} + 7; g \geq \frac{b}{2} + 7$