

7.9 Solve Systems of Linear Inequalities



Math and BAND
Ex. 31, p. 439

Standards **Alg. 9.0** Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. **Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.**

Connect **Before** you graphed linear inequalities in two variables. **Now** you will solve systems of linear inequalities in two variables.

- **system of linear inequalities**
- **solution of a system of linear inequalities**
- **graph of a system of linear inequalities**

A **system of linear inequalities** in two variables, or simply a *system of inequalities*, consists of two or more linear inequalities in the same variables. An example is shown.

$$\begin{aligned} x - y > 7 & \text{ Inequality 1} \\ 2x + y < 8 & \text{ Inequality 2} \end{aligned}$$

A **solution of a system of linear inequalities** is an ordered pair that is a solution of each inequality in the system. For example, $(6, -5)$ is a solution of the system above. The **graph of a system of linear inequalities** is the graph of all solutions of the system.

KEY CONCEPT

For Your Notebook

Graphing a System of Linear Inequalities

STEP 1 Graph each inequality.

STEP 2 Find the intersection of the half-planes. The graph of the system is this intersection.

EXAMPLE 1 Graph a system of two linear inequalities

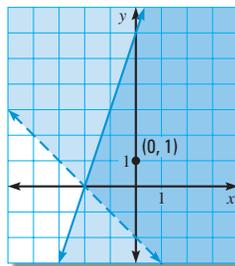
Graph the system of inequalities. $y > -x - 2$ **Inequality 1**
 $y \leq 3x + 6$ **Inequality 2**

Solution

Graph both inequalities in the same coordinate plane. The graph of the system is the intersection of the two half-planes, which is the region shown in the darker shade of blue.

CHECK Choose a point in the dark blue region, such as $(0, 1)$. To check this solution, substitute 0 for x and 1 for y into each inequality.

$$\begin{array}{l|l} 1 \stackrel{?}{>} 0 - 2 & 1 \stackrel{?}{\leq} 3(0) + 6 \\ 1 > -2 \checkmark & 1 \leq 6 \checkmark \end{array}$$



7.9 Solve Systems of Linear Inequalities 433

How to Teach the California Standards

Alg. 9.0 Students can use a system of inequalities to describe a region of a plane.

- Students graph each of two inequalities, using a solid or dashed line for each boundary and shading the appropriate half-plane for each inequality.
- They identify the region that is common to both shaded half-planes.

The solution to a system of inequalities is a region of the plane.

1 PLAN AND PREPARE

Warm-Up Exercises

Transparency Available

1. Graph $y < \frac{2}{3}x - 1$.



2. You are running one ad that costs \$6 per day and another that costs \$8 per day. You can spend no more than \$120. Name a possible combination of days that you can run the ads. **Sample: 16 days of the \$6 ad and 3 days of the \$8 ad**

Notetaking Guide

Transparency Available

Promotes interactive learning and notetaking skills, pp. 174–177.

Pacing

Suggested Number of Days

Basic	Average	Advanced
2 Days	2 Days	2 Days

Block: 1 Block

• See *Teaching Guide/Lesson Plan* in Chapter 7 Resource Book, pp. 96–97.

2 FOCUS AND MOTIVATE

Essential Question

Big Idea 3, p. 372

How do you solve systems of linear inequalities in two variables? **Tell students they will learn how to answer this question by graphing in the same coordinate plane.**

Motivating the Lesson

You have a landscaping software program to help you plan where to place flowers and trees in a park. By describing the outline of the park as a system of inequalities, you can show the park on a computer screen.

Mathematical Background

For systems of equations, the solution is the intersection of two lines, which is a point. For systems of inequalities, each graph is a half-plane. The intersection of half-planes is a region, so the solution of a system of inequalities is a region of the coordinate plane.

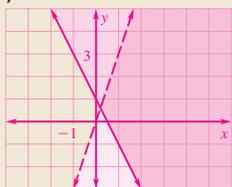
3 TEACH

Extra Example 1

Graph the system of inequalities.

$$y < 3x$$

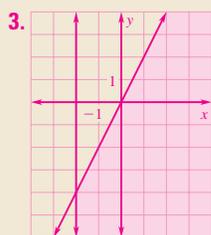
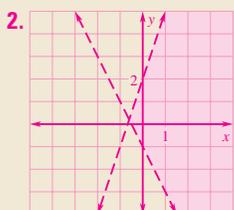
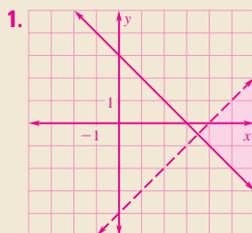
$$y \geq -2x + 1$$



An **Animated Algebra** activity in which students graph a system of inequalities is available online for **Example 1**. This activity is also available on the **Power Presentations CD-ROM**.

Extra Example 2

Using the four graphs in Example 2, which graph best represents the solution to the system $x - 2y \geq 2$ and $2x - y \leq 1$? **D**



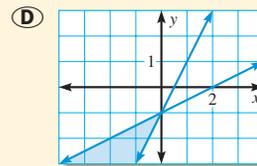
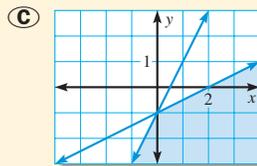
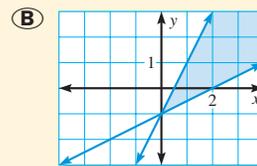
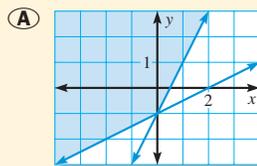
THE SOLUTION REGION In Example 1, the half-plane for each inequality is shaded, and the solution region is the intersection of the half-planes. From this point on, only the solution region will be shaded.

EXAMPLE 2 ♦ Multiple Choice Practice

Which graph *best* represents the solution to this system of inequalities?

$$2x \geq y + 1$$

$$-x + 2y \geq -2$$



Solution

Notice that the boundary lines are the same for all graphs. Choose a point that lies in the shaded region of each graph. Test the point in both inequalities to determine whether the shaded region is the solution of the system.

Choice A: The point (0, 1) lies in the shaded region.

$$2x \geq y + 1$$

$$-x + 2y \geq -2$$

$$2(0) \stackrel{?}{\geq} 1 + 1$$

$$-(0) + 2(1) \stackrel{?}{\geq} -2$$

$$0 \geq 2 \quad \times$$

$$2 \geq -2 \quad \checkmark$$

Choice B: The point (2, 1) lies in the shaded region.

$$2x \geq y + 1$$

$$-x + 2y \geq -2$$

$$2(2) \stackrel{?}{\geq} 1 + 1$$

$$-(2) + 2(1) \stackrel{?}{\geq} -2$$

$$4 \geq 2 \quad \checkmark$$

$$0 \geq -2 \quad \checkmark$$

► The correct answer is B. (A) (B) (C) (D)



GUIDED PRACTICE for Examples 1 and 2

Graph the system of linear inequalities. 1–3. See margin.

1. $y < x - 4$
 $y \geq -x + 3$

2. $2x + y > -1$
 $y < 3x + 2$

3. $y \leq 2x$
 $x \geq -2$

Universal Access

Auditory Tell students that the method used in **Example 1** is sometimes called the “graph-and-check” method, because students *graph* the inequalities and then *check* points in each test region. Students should get in the habit of checking their graphs by verifying that points in their solution satisfy each inequality.

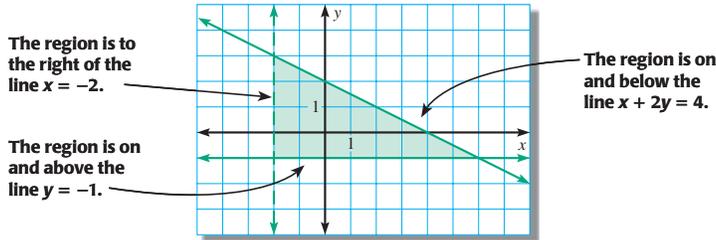
EXAMPLE 3 Graph a system of three linear inequalities

Graph the system of inequalities.

$y \geq -1$	Inequality 1
$x > -2$	Inequality 2
$x + 2y = 4$	Inequality 3

Solution

Graph all three inequalities in the same coordinate plane. The graph of the system is the triangular region shown.



About the Standards

The set of all points (x, y) that satisfy each inequality in Example 3 is called the *solution set* of the system. The graph of the solution set is represented by the solution region shown.

EXAMPLE 4 Write a system of linear inequalities

Write a system of inequalities for the shaded region.

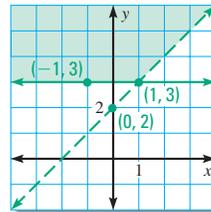
Solution

Inequality 1: One boundary line for the shaded region is $y = 3$. Because the line is *solid*, the inequality is either \geq or \leq . Test the point $(0, 4)$ from the solution region to determine the correct inequality sign. Because $4 \geq 3$, the inequality is $y \geq 3$.

Inequality 2: The other boundary line has a slope of 1 and a y -intercept of 2. So, its equation is $y = x + 2$. Because the line is *dashed*, the inequality is either $<$ or $>$. Test the point $(0, 4)$ to determine the correct inequality sign. Because $4 > 0 + 2$, the inequality is $y > x + 2$.

► The system of inequalities for the shaded region is:

$y \geq 3$	Inequality 1
$y > x + 2$	Inequality 2



REVIEW EQUATIONS OF LINES

For help with writing an equation of a line, see pp. 322, 340, and 347.

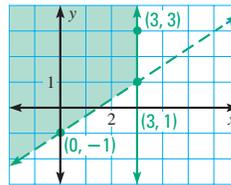
GUIDED PRACTICE for Examples 3 and 4

Graph the system of inequalities. 4, 5. See margin.

4. $y \geq -x + 2$	5. $y - x \leq 1$
$y < 4$	$y < -1$
$x < 3$	$x < 1$

6. Write a system of inequalities for the shaded region shown at the right.

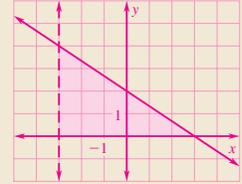
$$x \leq 3, y > \frac{2}{3}x - 1$$



Extra Example 3

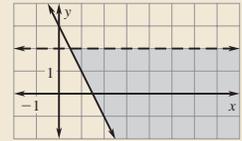
Graph the system of inequalities.

$$\begin{aligned} y &\geq 0 \\ x &> -3 \\ 2x + 3y &\leq 6 \end{aligned}$$

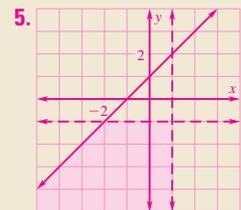
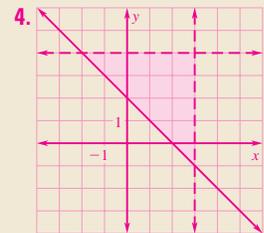


Extra Example 4

Write a system of inequalities for the shaded region.



$$y < 2 \text{ and } y \geq -2x + 3$$



Applying Standards

Examples 3 and 4 Students relate systems of inequalities and graphs, as called for in Standard **Alg. 9.0**.

- In Example 3, students are given a system of three inequalities. They graph each one and find the region common to all.
- In Example 4, students are given a region of a graph. They use the boundary lines of the region to write a system of inequalities that describes the region.

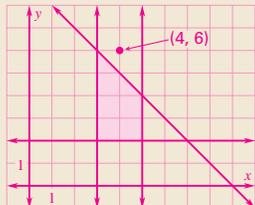
EXAMPLE 5 Write and solve a system of linear inequalities

Extra Example 5

A logo contest requires that the logo width be between 3 and 5 inches, the height no less than 2 inches, and the sum of the width and height no more than 9 inches.

- a. Write and graph a system of linear inequalities that describes the information given above.

inequalities: $x \geq 3$, $x \leq 5$,
 $x + y \leq 9$, $y \geq 2$



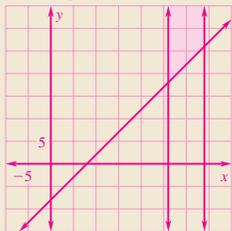
- b. You enter a logo 4 inches wide and 6 inches high. Use the graph to determine if it meets contest requirements. **Because the point falls outside the solution region, the logo does not meet requirements.**

Closing the Lesson

Students have learned to write, graph, and solve systems of linear inequalities. To bring closure, have students answer these questions:

- Essential Question: How do you solve systems of linear inequalities in two variables? **Graph each inequality in the same coordinate plane. The graph of the system is the intersection of all of the graphs.**
- Describe the solution of the system of inequalities $x \geq -2$ and $x \leq 5$. **The solution is all points on the two vertical lines $x = -2$ and $x = 5$ and all the points in the plane between the two lines.**

7. $x - y \leq 8$, $x \geq 26$, $x \leq 34$, $y \geq 0$;



BASEBALL The National Collegiate Athletic Association (NCAA) regulates the lengths of aluminum baseball bats used by college baseball teams. The NCAA states that the length (in inches) of the bat minus the weight (in ounces) of the bat cannot exceed 3. Bats can be purchased at lengths from 26 to 34 inches.

- Write and graph a system of linear inequalities that describes the information given above.
- A sporting goods store sells an aluminum bat that is 31 inches long and weighs 25 ounces. Use the graph to determine if this bat can be used by a player on an NCAA team.



Solution

- a. Let x be the length (in inches) of the bat, and let y be the weight (in ounces) of the bat. From the given information, you can write the following inequalities:

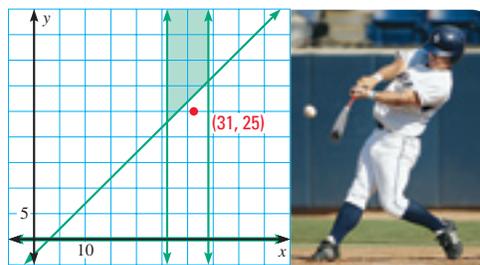
$x - y \leq 3$ **The difference of the bat's length and weight can be at most 3.**

$x \geq 26$ **The length of the bat must be at least 26 inches.**

$x \leq 34$ **The length of the bat can be at most 34 inches.**

$y \geq 0$ **The weight of the bat cannot be a negative number.**

Graph each inequality in the system. Then identify the region that is common to all of the graphs of the inequalities. This region is shaded in the graph shown.



- b. Graph the point that represents a bat that is 31 inches long and weighs 25 ounces.

▶ Because the point falls outside the solution region, the bat cannot be used by a player on an NCAA team.

GUIDED PRACTICE for Example 5

7. **WHAT IF?** In Example 5, suppose a Senior League (ages 10–14) player wants to buy the bat described in part (b). In Senior League, the length (in inches) of the bat minus the weight (in ounces) of the bat cannot exceed 8. Write and graph a system of inequalities to determine whether the described bat can be used by the Senior League player. **See margin.**

WRITE SYSTEMS OF INEQUALITIES

Consider the values of the variables when writing a system of inequalities. In many real-world problems, the values cannot be negative.

7.9 EXERCISES

HOMWORK KEY

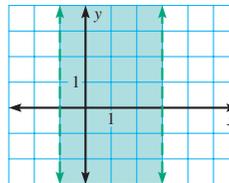
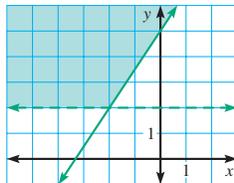
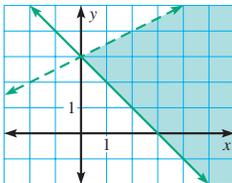
- ◆ = **MULTIPLE CHOICE PRACTICE**
Exs. 6, 19, 20, 34, and 39–41
- = **HINTS AND HOMEWORK HELP**
for Exs. 11, 23, and 33 at classzone.com

SKILLS • PROBLEM SOLVING • REASONING

- A** 1. **VOCABULARY** Copy and complete: The graph of a system of linear inequalities is the graph of all ? of the system. **solutions**
2. **WRITING** Describe the steps you would take to graph the system of inequalities shown. $x \geq 2$ **Inequality 1**
 $y \geq 3$ **Inequality 2**

CHECKING A SOLUTION Tell whether the ordered pair is a solution of the system of inequalities.

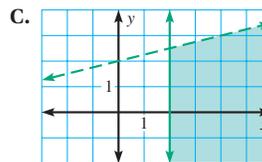
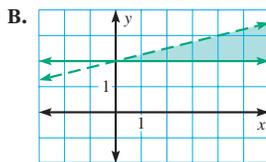
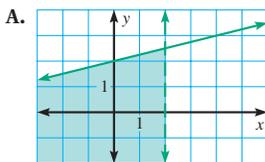
3. (1, 1) **not a solution** 4. (0, 6) **solution** 5. (3, -1) **not a solution**



6. **MULTIPLE CHOICE** Which ordered pair is a solution of the system $2x - y \leq 5$ and $x + 2y > 2$? **D**
- (A) (1, -1) (B) (4, 1) (C) (2, 0) (D) (3, 2)

MATCHING SYSTEMS AND GRAPHS Match the system of inequalities with its graph.

7. $x - 4y > -8$
 $x \geq 2$ **C**
8. $x - 4y \geq -8$
 $x < 2$ **A**
9. $x - 4y > -8$
 $y \geq 2$ **B**



GRAPHING A SYSTEM Graph the system of inequalities. **10–18. See margin.**

10. $y < -2x + 3$
 $y \geq 4$
11. $y \geq 0$
 $y < 2.5x - 1$
12. $y \geq 2x + 1$
 $y < -x + 4$
13. $x < 8$
 $x - 4y \leq -8$
14. $y \geq -2$
 $2x + 3y > -6$
15. $y - 2x < 7$
 $y + 2x > -1$
16. $x < 4$
 $y > 1$
 $y \geq -x + 1$
17. $x \geq 0$
 $y \geq 0$
 $6x - y < 12$
18. $x + y \leq 10$
 $x - y \geq 2$
 $y \geq 2$
19. **MULTIPLE CHOICE** Which ordered pair is a solution of the system $x \leq 5$, $y \geq 3$, and $x - y < 2$? **D**
- (A) (2, -2) (B) (6, 3) (C) (2, 0) (D) (2, 4)

4 PRACTICE AND APPLY

Assignment Guide

Answer Transparencies available for all exercises

Basic:

Day 1: pp. 437–440
Exs. 1–12, 19–21
Day 2: pp. 437–440
Exs. 22–24, 29–33, 39–41

Average:

Day 1: MCP p. 371 Exs. 11, 12
pp. 437–440
Exs. 1–9, 13–15, 19–21
Day 2: CR p. 244 Exs. 27–29
MCP p. 371 Exs. 13, 14
pp. 437–440
Exs. 23–26, 28, 31–35

Advanced:

Day 1: MRSPS p. 361 Exs. 3–5
pp. 437–440
Exs. 1–6, 13–21
Day 2: MRSPS p. 361 Exs. 6, 7
CR p. 244 Exs. 10–12
pp. 437–440
Exs. 25–28, 32–38*

Block:

CR p. 244 Exs. 27–29
MCP p. 371 Exs. 11–14
pp. 437–440
Exs. 1–9, 13–15, 19–21, 23–26, 28, 31–35

Homework Check

For a quick check of student understanding of key concepts, go over the following exercises:

Basic: 8, 12, 22, 31, 32

Average: 12, 14, 24, 31, 33

Advanced: 16, 18, 26, 32, 33

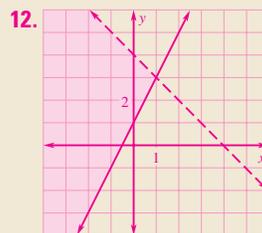
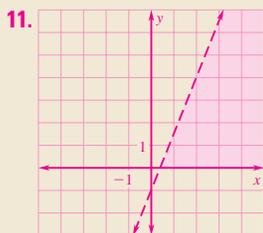
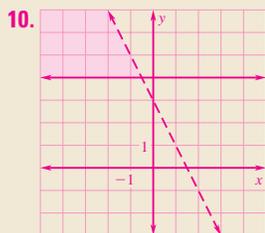
Extra Practice

- Student Edition, p. 816
- Chapter 7 Resource Book: Practice Levels A, B, C, pp. 100–105

Practice Worksheet

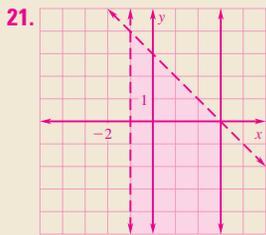
An easily readable reduced practice page (with answers) for this lesson can be found on pp. 372E–372H.

13–18. See Additional Answers beginning on p. AA1.



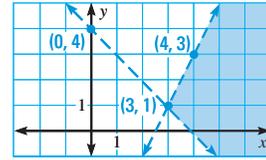
Avoiding Common Errors

Exercise 5 Some students may think the ordered pair is a solution of the system of inequalities since it appears on the boundary. Remind these students that a dashed line is the graph of an inequality containing $<$ or $>$, so an ordered pair on a dashed line cannot be a solution of the system. You may want to point out that an ordered pair on a solid line is a solution of the system of inequalities.



20. **MULTIPLE CHOICE** The graph of which system of inequalities is shown? **B**

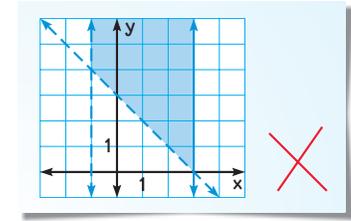
- (A) $y < 2x - 5$
 $2x + 2y < 8$
- (B) $y < 2x - 5$
 $2x + 2y > 8$
- (C) $y > 2x - 5$
 $2x + 2y < 8$
- (D) $y > 2x - 5$
 $2x + 2y > 8$



21. **ERROR ANALYSIS** Describe and correct the error in graphing this system of inequalities:

$x + y < 3$ Inequality 1
 $x > -1$ Inequality 2
 $x \leq 3$ Inequality 3

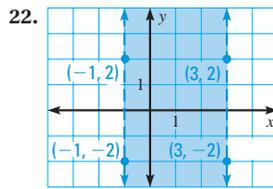
The graph is shaded to include $x + y > 3$, instead of $x + y < 3$; see margin for art.



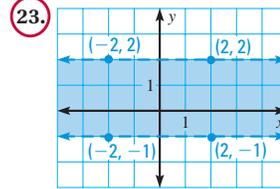
EXAMPLE 4

on p. 435
for Exs. 22–27

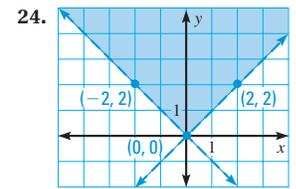
WRITING A SYSTEM Write a system of inequalities for the shaded region.



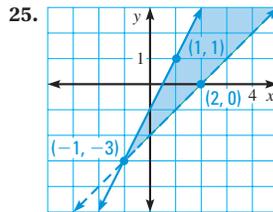
$x > -1, x < 3$



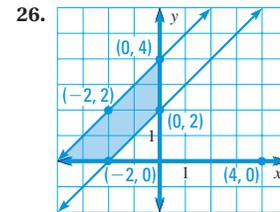
$y > -1, y < 2$



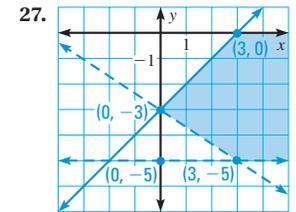
$y > x, y > -x$



$y \leq 2x - 1, y > x - 2$



$y \geq x + 2, y \leq x + 4, x \leq 0, y \geq 0$



$y > -\frac{2}{3}x - 3, y \leq x - 3, y > -5$
 $y \leq 0$

28. **REASONING** Does the system of inequalities have any solutions? Explain.

$x - y > 5$ Inequality 1
 $x - y < 1$ Inequality 2

No. Sample answer: The lines are parallel and their shaded regions do not overlap.

- B** **CONNECT SKILLS TO PROBLEM SOLVING** Exercises 29 and 30 will help you prepare for problem solving.

Write a system of inequalities that models the situation.

29. For a workout, you want to spend at least 20 minutes running and at least 10 minutes weightlifting. You also want the workout to last no more than 40 minutes. Let x be the time spent running and y be the time spent weightlifting. $x \geq 20, y \geq 10, x + y \leq 40$
30. You have two gifts to buy. You plan to spend no more than \$50 on the two gifts combined. You want to spend at least twice as much on the first gift as on the second gift. Let x be the amount you spend on the first gift and y be the amount you spend on the second gift. $x + y \leq 50, x \geq 2y$

Applying Standards

Exercises 10–18, 22–27 Students relate systems of inequalities and graphs, as called for in Standard **Alg. 9.0**.

- In Exercises 10–18, students are given a system of inequalities. They graph each inequality and find the common region.
- In Exercises 22–27, students are given a region of a graph. They use the boundary lines and the shaded region to write a system of inequalities.

EXAMPLE 5
on p. 436
for Exs. 31–33

- 31. COMPETITION SCORES** In a marching band competition, scoring is based on a musical evaluation and a visual evaluation. The musical evaluation score cannot exceed 60 points, and the visual evaluation score cannot exceed 40 points. Write and graph a system of inequalities for the scores that a marching band can receive. $x \leq 60, y \leq 40, x > 0, y > 0$, see margin for art.

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- 32. NUTRITION** For a hiking trip, you are making a mix of x ounces of peanuts and y ounces of dried fruit. You want the mix to have less than 60 grams of fiber and weigh less than 20 ounces. An ounce of peanuts has 14 grams of fiber, and an ounce of dried fruit has 2 grams of fiber. Write and graph a system of inequalities that models the situation.

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$14x + 2y < 60, x + y < 20, x \geq 0, y \geq 0$, see margin for art.

- 33. FISHING LIMITS** You are fishing in a marina for surfperch and rockfish, which are two species of bottomfish. Gaming laws in the marina allow you to catch no more than 15 surfperch per day, no more than 10 rockfish per day, and no more than 15 total bottomfish per day.



- a. Write and graph a system of inequalities that models the situation.
 $s \leq 15, r \leq 10, s + r \leq 15, s > 0, r > 0$, see margin for art.
b. Use the graph to determine whether you can catch 11 surfperch and 9 rockfish in one day. **no**

- 34. MULTIPLE CHOICE** A person's maximum heart rate (in beats per minute) is given by $220 - x$ where x is the person's age in years ($20 \leq x \leq 65$). When exercising, a person should aim for a heart rate that is at least 70% of the maximum heart rate and at most 85% of the maximum heart rate. Which of the following heart rates is *not* in the suggested target range for a 40-year-old person who is exercising? **A**

- (A) 120 beats per minute (B) 130 beats per minute
(C) 140 beats per minute (D) 150 beats per minute

35. a. $8x + 8y \leq 48, 4x + 2y \geq 16, x \geq 0, y \geq 0$, see margin for art.

35. b. Yes, it will cost \$48 and give you 18 pictures.

- 35. SHORT RESPONSE** A self-service photo center allows you to make prints of pictures. Each sheet of printed pictures costs \$8. The number of pictures that fit on each sheet is shown.

- a. You want at least 16 pictures of any size, and you are willing to spend up to \$48. Write and graph a system of inequalities that models the situation.

Four 3 inch by 5 inch pictures fit on one sheet.



Two 4 inch by 6 inch pictures fit on one sheet.



- b. Will you be able to purchase 12 pictures that are 3 inches by 5 inches and 6 pictures that are 4 inches by 6 inches? *Explain.*

Study Strategy

Exercises 31–35 Remind students that real-world situations often do not include negative solutions. If the situation warrants a restriction to a certain quadrant, students should include that inequality when they write the system of inequalities.

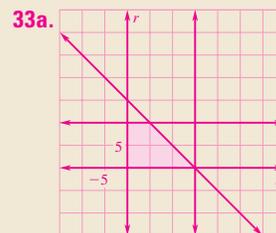
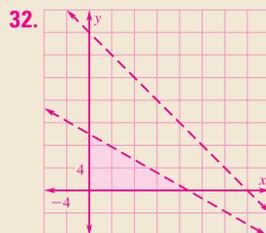
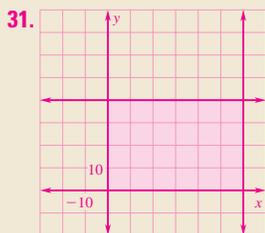
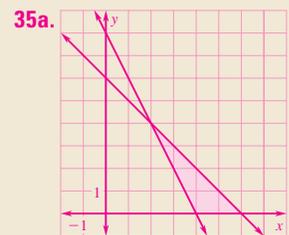
Academic Vocabulary

Exercises 31, 33, 34 Encourage students to pay close attention to the phrases “cannot exceed,” “no more than,” “at least,” and “at most.” Point out that all of these phrases share a common meaning of “less than or equal to.”

Internet Reference

Exercise 33 For more information about bottomfish and local fishing laws, visit Hawaii's Department of Aquatic Resources at www.state.hi.us/dlnr/dar/bottomfish/index.htm

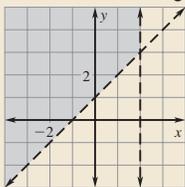
Exercise 34 To learn more about maximum heart rates, visit the American Heart Association's website at www.americanheart.org and do a search for “target heart rates.”



5 ASSESS AND RETEACH

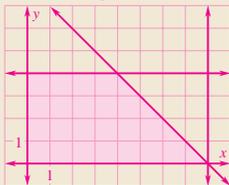
Daily Homework Quiz

1. Write a system of inequalities for the shaded region.



$$x < 2, y > x + 1$$

2. A bibliography can refer to at most 8 articles, at most 4 books, and at most 8 references in all. Write and graph a system of inequalities that models the situation. $x =$ articles, $y =$ books; $x \leq 8, y \leq 4, x + y \leq 8, x \geq 0,$ and $y \geq 0$



Online Quiz classzone.com

An alternate quiz for Lessons 7.8–7.9 is available online in multiple choice format.

Diagnosis/Remediation

- Practice A, B, C in Chapter 7 Resource Book, pp. 100–105
- Study Guide in Chapter 7 Resource Book, pp. 106–107
- Practice Workbook, pp. 108–110
- California@HomeTutor

Challenge

Additional challenge is available in the Chapter 7 Resource Book, p. 110.

Quiz

An easily readable reduced copy of the quiz on Lessons 7.8–7.9 (with answers) from the Assessment Book can be found on pp. 372I–372L.

38a, Quiz 1–9. See Additional Answers beginning on p. AA1.

C CHALLENGE Write a system of inequalities for the shaded region described.

$$37. y \leq \frac{1}{3}x + 1, \\ y \geq \frac{4}{3}x - 2, \\ y \geq -\frac{2}{3}x - 2$$

36. The shaded region is a rectangle with vertices at (2, 1), (2, 4), (6, 4), and (6, 1). $x \geq 2, x \leq 6, y \geq 1, y \leq 4$

37. The shaded region is a triangle with vertices at (–3, 0), (3, 2), and (0, –2).

38. **CHALLENGE** You make necklaces and keychains to sell at a craft fair. The table shows the time that it takes to make each necklace and keychain, the cost of materials for each necklace and keychain, and the time and money that you can devote to making necklaces and keychains.

	Necklace	Keychain	Available
Time to make (hours)	0.5	0.25	20
Cost to make (dollars)	2	3	120

- Write and graph a system of inequalities for the number x of necklaces and the number y of keychains that you can make under the given constraints. $0.5x + 0.25y \leq 20, 2x + 3y \leq 120, x \geq 0, y \geq 0$, see margin for art.
- Find the vertices (corner points) of the graph. (0, 0), (40, 0), (0, 40), (30, 20)
- You sell each necklace for \$10 and each keychain for \$8. The revenue R is given by the equation $R = 10x + 8y$. Find the revenue for each ordered pair in part (b). Which vertex results in the maximum revenue? \$0, \$400, \$320, \$460; (30, 20)

◆ CALIFORNIA STANDARDS SPIRAL REVIEW

- Alg. 4.0** 39. Which equation is equivalent to $-(3x + 5) + 4x = 0$? (p. 139) **B**
- (A) $2x = -10$ (B) $2x = 10$ (C) $10x = -10$ (D) $10x = 10$
- Alg. 6.0** 40. What is the x -intercept of the graph of $y = -5$? (p. 273) **D**
- (A) -5 (B) 0 (C) 5 (D) Does not exist
- Alg. 7.0** 41. The equation $2x + 5y = 20$ models a purchase of \$20 for x boxes of dog bones and y bags of dog food. Which ordered pair (x, y) does *not* give a possible combination of boxes of dog bones and bags of dog food? (p. 264) **B**
- (A) (0, 4) (B) (2, 5) (C) (5, 2) (D) (10, 0)

QUIZ for Lessons 7.8–7.9

Graph the inequality. (p. 425) 1–3. See margin.

1. $x + y \geq 3$ 2. $x < 14$ 3. $2y - x \leq 8$

Graph the system of inequalities. (p. 433) 4–9. See margin.

4. $x > -3$ 5. $y \leq 2$ 6. $4x \geq y$
 $x < 7$ $y < 6x + 2$ $-x + 4y < 4$
7. $x > -5$ 8. $y \geq 3x - 4$ 9. $x + y < 2$
 $x < 0$ $y \leq x$ $2x + y > -3$
 $y \leq 2x + 7$ $y \geq -5x - 15$ $y \geq 0$

440 Chapter 7 Systems of Equations and Inequalities

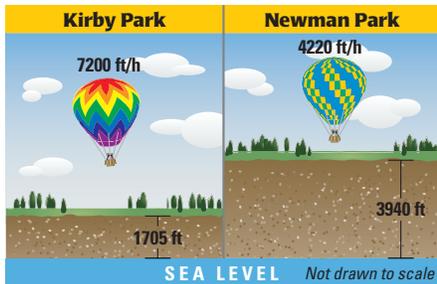
EXTRA STANDARDS SPIRAL REVIEW

- Alg. 4.0** ◆ 1. Which equation is equivalent to $-(8 - 7x) - 6x = 0$? **D**
- (A) $2x = -24$ (B) $2x = 24$ (C) $3x = -24$ (D) $3x = 24$
- Alg. 6.0** ◆ 2. What is the y -intercept of the graph of $x = -3$? **D**
- (A) -3 (B) 0 (C) $\frac{1}{3}$ (D) Does not exist
- Alg. 7.0** ◆ 3. Which ordered pair does *not* satisfy the equation $7x - 2y = 15$? **A**
- (A) (15, 90) (B) (11, 31) (C) (7, 17) (D) (3, 3)

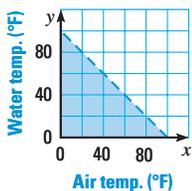
MIXED REVIEW of Skills and Problem Solving

Multiple Choice Practice for Lessons 7.6–7.9

1. The hot air balloons shown below are launched at the same time and ascend at the rates shown. After how long will the balloons be at the same elevation? **Alg. 15.0 A**



- (A) 45 min (B) 1 h
 (C) 2 h (D) No solution
2. You mix 60 grams of a 10% saline solution with 40 grams of a 7% saline solution. What percent of the mixture is salt? **Alg. 15.0 B**
- (A) 5% (B) 8.8%
 (C) 17% (D) 91.2%
3. River rafters are required to wear protective suits if the sum of the water temperature and air temperature is less than 100°F . The graph below represents the air temperatures x and water temperatures y for which a protective suit is required. How would you change the graph to describe the situations in which a protective suit is *not* required? **Alg. 6.0 D**

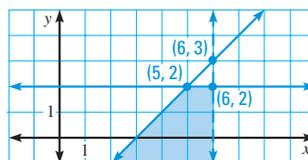


- (A) Shade only above the boundary line.
 (B) Change the line from dashed to solid.
 (C) Remove all shading.
 (D) Make the boundary line solid and shade only above it.

4. You want to make 500 grams of a 20% saline solution. To do this, you mix x grams of a 10% saline solution with y grams of a 30% saline solution. What are the values of x and y ? **Alg. 15.0 B**

- (A) $x = 200$
 $y = 300$ (B) $x = 250$
 $y = 250$
 (C) $x = 300$
 $y = 200$ (D) $x = 500$
 $y = 500$

5. The graph of which system of inequalities is shown? **Alg. 9.0 D**



- (A) $y \leq 2$
 $x < 6$
 $y \geq x - 3$ (B) $y \geq 2$
 $x < 6$
 $y \geq x - 3$
 (C) $y \leq 2$
 $x > 6$
 $y \geq x - 3$ (D) $y \leq 2$
 $x < 6$
 $y \leq x - 3$

6. Which ordered pair is a solution of the system $x + 2y \leq -2$ and $y \leq -3x + 4$? **Alg. 9.0 B**

- (A) (0, 0) (B) (2, -2)
 (C) (-2, 2) (D) (5, -4)

7. What is the area (in square feet) of the triangular garden defined by the system of inequalities below? **Alg. 9.0 C**

$$\begin{aligned} y &\geq 0 \\ x &\geq 0 \\ 4x + 5y &\leq 60 \end{aligned}$$

- (A) 30 ft^2 (B) 60 ft^2
 (C) 90 ft^2 (D) 180 ft^2

8. Which ordered pair is *not* a solution of the inequality $3y \leq 5x + 6$? **Alg. 6.0 B**

- (A) (1, 0) (B) (-3, -1)
 (C) (-1, -3) (D) (0, 1)

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Students who need more review and practice should see the following lessons in the **California@HomeTutor**.

- Exercise 1:** Lesson 7.6
Exercise 2: Lesson 7.7
Exercise 3: Lesson 7.8
Exercise 4: Lesson 7.7
Exercise 5: Lesson 7.9
Exercise 6: Lesson 7.9
Exercise 7: Lesson 7.9
Exercise 8: Lesson 7.8

Applying Mathematical Reasoning to Alg. 15.0 and Alg. 9.0

Exercise 1 To reason through this exercise, students must set up and solve a rate problem, as called for in **Alg. 15.0**.

Relevant information in Exercise 1:

- One balloon starts at 1705 ft and ascends at 7200 ft/h.
- The other balloon starts at 3940 ft and ascends at 4220 ft/h.

Relationship involved: The balloons will be at the same height when $1705 + 7200t = 3940 + 4220t$, where t represents the number of hours.

Exercise 6 To reason through this exercise, students use a system of inequalities, as called for in **Alg. 9.0**.

Relevant information in Exercise 6:

- The exercise presents two inequalities.
- The answer choices present four ordered pairs.

Relationship involved: An ordered pair is a solution to a system of inequalities if the ordered pair satisfies every inequality in the system.