



Practice by Example

Example 1
(page 378)

Is the given ordered pair a solution of the system?

1. $(1, 19)$
 $y \leq 7x - 13$
 $y > 3x + 6$

2. $(4, 10)$
 $9x - y \geq 23$
 $5x + 0.2y \geq 20$

3. $(-2, 40)$
 $y > -13x + 29$
 $y \leq 9x + 11$

Solve each system by graphing.

4. $y < 2x + 4$
 $-3x - 2y \geq 6$

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

6. $y > 2x + 4$
 $2x - y \leq 4$

7. $y > \frac{1}{4}x$
 $y \leq -x + 4$

8. $y < 2x - 3$
 $y > 5$

9. $y \leq -\frac{1}{3}x + 7$
 $y \geq -x + 1$

$$\begin{aligned} 10. \quad & x + 2y \leq 10 \\ & x + 2y \geq 9 \end{aligned}$$

$$\begin{aligned} 11. \quad & y \geq -x + 5 \\ & y \leq 3x - 4 \end{aligned}$$

$$\begin{aligned} 12. \quad & y \leq 0.75x - 2 \\ & y > 0.75x - 3 \end{aligned}$$

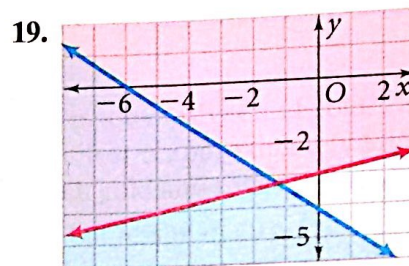
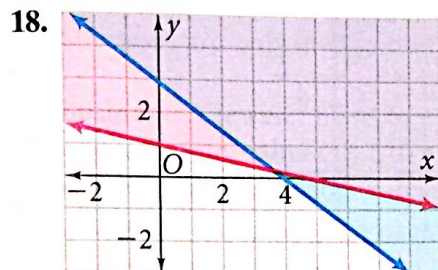
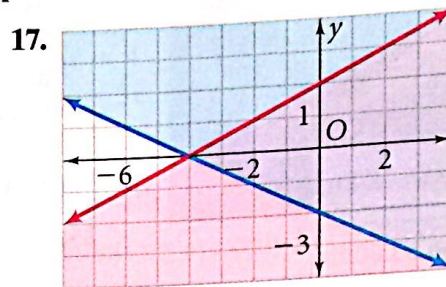
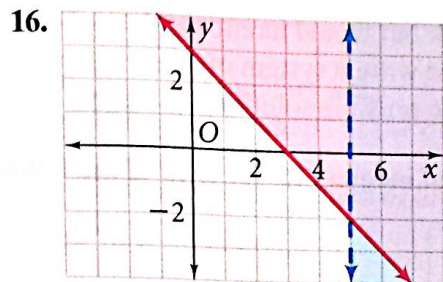
$$\begin{aligned} 13. \quad & 8x + 4y \geq 10 \\ & 3x - 6y > 12 \end{aligned}$$

$$\begin{aligned} 14. \quad & 2x - \frac{1}{4}y < 1 \\ & 4x + 8y > 4 \end{aligned}$$

$$\begin{aligned} 15. \quad & 6x - 5y < 15 \\ & x + 2y \geq 7 \end{aligned}$$

Example 2
(page 378)

Write a system of inequalities for each graph.



Example 3
(page 379)

20. **Budget** Suppose you buy flour and cornmeal in bulk to make flour tortillas and corn tortillas. Flour costs \$1.50/lb. Cornmeal costs \$2.50/lb. You want to spend less than \$9.50 on flour and cornmeal, and you need at least 4 lb altogether.

- Write a system of inequalities that describes this situation.
- Graph the system to show all possible solutions.

21. Suppose you want to fence a rectangular area for your dog. You will use the house as one of the four sides. Since the house is 40 ft wide, the length ℓ needs to be no more than 40 ft. You plan to use at least 150 ft of fencing. Graph the following system to find possible dimensions for the rectangle.

$$\begin{aligned} \ell &\leq 40 \\ \ell + 2w &\geq 150 \end{aligned}$$

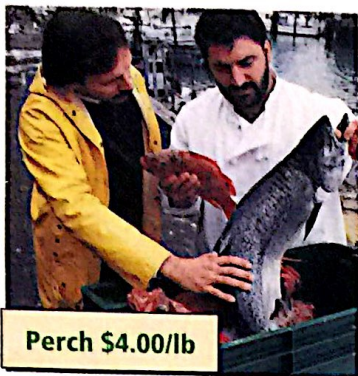


Example 4
(page 380)

22. Suppose you receive a \$50 gift certificate to the Cityside Music and Books store. All CDs at the store cost \$9.99, and all books cost \$5.99. You want to buy some books and at least one CD.

- Write a system of inequalities for x books and y CDs that describes this situation.
- Graph the system to show all possible solutions.
- What purchase does the ordered pair $(2, 6)$ represent? Is it a solution to your system? Explain.
- Find a solution in which you spend almost all of the gift certificate.

B Apply Your Skills

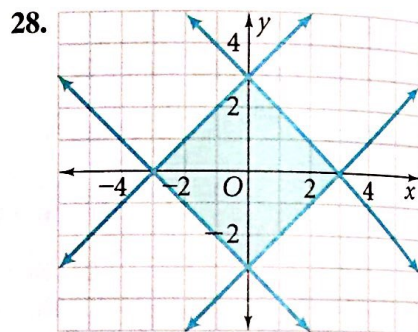
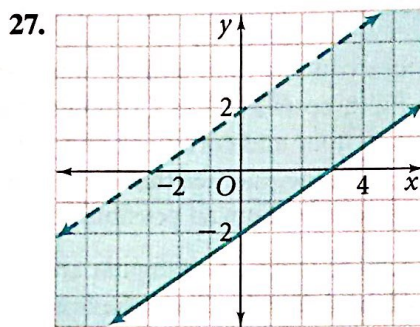
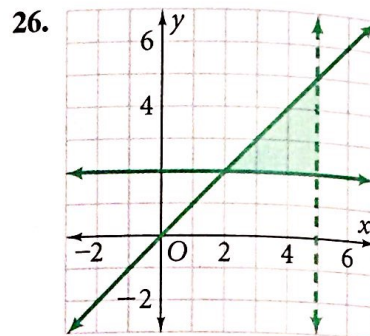
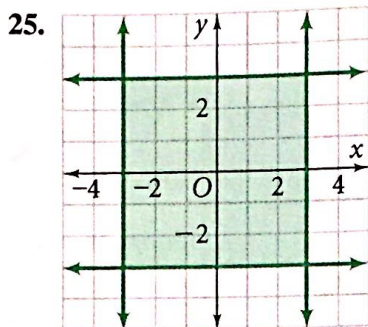


Perch \$4.00/lb

Salmon \$3.00/lb

23. **Business** A seafood restaurant owner orders perch and salmon. He wants to buy at least 50 pounds of fish but cannot spend more than \$180. Write and graph a system of inequalities to show the possible combinations of perch and salmon he could buy.
24. **Earnings** Suppose you have a job in an ice cream shop that pays \$6 per hour. You also have a babysitting job that pays \$4 per hour. You want to earn at least \$60 per week but would like to work no more than 12 hours per week.
- Graph and write a system of linear inequalities that describes this situation.
 - Give three possible solutions to the system.

Write a system of inequalities for each of the following graphs.



29. **Open-Ended** Write a system of four inequalities that describes a rectangle. Graph the system.
30. **Geometry** The following system of inequalities describes a right isosceles triangle.
- Find m .
 - Find the area of the triangle.
- $$\begin{aligned} x &> 0 \\ y &> 0 \\ y &< mx + 4 \end{aligned}$$

Geometry The solution region of each system of linear inequalities below forms a figure. (a) Describe the shape. (b) Find the vertices. (c) Find the area.

31.
$$\begin{aligned} y &\geq \frac{1}{2}x + 1 \\ y &\leq 2 \\ x &\geq -4 \end{aligned}$$

32.
$$\begin{aligned} x &\geq 1 \\ x &\leq 5 \\ y &\geq -1 \\ y &\leq 3 \end{aligned}$$

33.
$$\begin{aligned} x &\geq 0 \\ x &\leq 2 \\ y &\geq -4 \\ y &\leq -x + 2 \end{aligned}$$

34.
$$\begin{aligned} x &\geq 2 \\ y &\geq -3 \\ x + y &\leq 4 \end{aligned}$$

35. **a. Business** A clothing store has a going-out-of-business sale. They are selling pants for \$10.99 and shirts for \$4.99. You can spend as much as \$45 and want to buy at least one pair of pants. Write and graph a system of inequalities that describes this situation.
- b.** Suppose you need to buy at least three pairs of pants. From your graph, find all the ordered pairs that are possible solutions.

36. a. Graph each inequality. $y > 4x + 1$
 $y < 4x - 2$
 b. **Writing** Will the boundary lines $y = 4x + 1$ and $y = 4x - 2$ ever intersect? Explain.
 c. Will the shaded regions you drew in part (a) overlap?
 d. Does the system of inequalities have any solutions?

37. a. Graph the system of inequalities. $y > 3x - 5$
 $y < 3x + 4$
 b. Will the boundary lines $y = 3x - 5$ and $y = 3x + 4$ ever intersect? Explain.
 c. Describe the shape of the overlapping region.

Open-Ended Write a system of linear inequalities with the given characteristics.

38. $(0, 0)$ is a solution. 39. Solutions are only in Quadrant II.
 40. There is no solution. 41. $(3, 7)$ is not a solution.
 42. Solutions are only in Quadrant IV.



Challenge

43. **Business** A jeweler plans to produce a ring made of silver and gold. The price of gold is approximately \$10/g. The price of silver is approximately \$.15/g. She considers the following in deciding how much gold and silver to use in the ring.
- The total mass must be more than 10 g but less than 20 g.
 - The ring must contain at least 3 g of gold.
 - The total cost of the gold and silver must be less than \$60.

Let s = the mass of silver in grams and d = the mass of gold in grams.

- a. Write and graph the four inequalities that describe this situation.
 b. For one solution (s, d) , find the mass of the ring and the cost of the gold and silver.

44. Solve $|y| \geq x$. (*Hint*: Write two inequalities; then graph them.)

Write a system of linear inequalities with the given characteristics.

45. $(2, 5)$ and $(5, 2)$ are not solutions; $(5, 5)$ is a solution.
 46. $(-3, 2)$ and $(3, 2)$ are not solutions; $(-2, 6)$ is a solution.

47. **Sports** During part of the baseball season, a player had 120 hits in 305 at-bats. The ratio $\frac{120}{305}$ gave him a .393 batting average. (Batting averages are rounded to the nearest thousandth.) The inequality $\frac{120 + h}{305 + a} \geq .400$ gives the number of hits h needed during his next at-bats a to reach at least a .400 average. The inequality $h \leq a$ indicates the player cannot have more hits than at-bats.
- a. Solve $\frac{120 + h}{305 + a} \geq .400$ for h .
 b. Graph the system.
 c. What does a solution mean in terms of the original problem?

48. **Business** A drum maker sells two sizes of frame drums like the ones at the left. A 14-in. drum sells for \$180 and an 18-in. drum sells for \$240. He is trying to decide how many drums to build and considers the following:
- He wants to produce and sell at least \$2700 worth of drums.
 - He has materials to make no more than 17 drums.
 - He plans to make more 14-in. drums than 18-in. drums.
 - He wants to make at least four 18-in. drums.
- a. Write and graph the four inequalities that describe this situation.
 b. Give one possible solution to the system.

