

ABSOLUTE VALUE INEQUALITIES Graphing an absolute value inequality is similar to graphing a linear inequality, but the boundary is an absolute value graph.

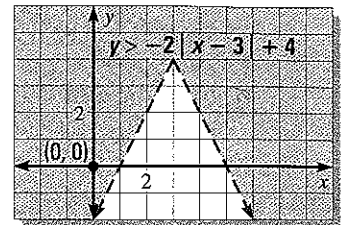
EXAMPLE 5 Graph an absolute value inequality

Graph $y > -2|x - 3| + 4$ in a coordinate plane.

Solution

STEP 1 Graph the equation of the boundary, $y = -2|x - 3| + 4$. Use a dashed line because the inequality symbol is $>$.

STEP 2 Test the point $(0, 0)$. Because $(0, 0)$ is a solution of the inequality, shade the portion of the coordinate plane outside the absolute value graph.



GUIDED PRACTICE for Examples 4 and 5

11. WHAT IF? Repeat the steps of Example 4 if each student group is allotted up to 420 MB of video space.

Graph the inequality in a coordinate plane.

12. $y \leq |x - 2| + 1$ 13. $y \geq -|x + 3| - 2$ 14. $y < 3|x - 1| - 3$

2.8 EXERCISES

HOMEWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS4 for Exs. 15, 25, and 45
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 21, 28, 39, 40, 41, 46, and 48

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: The graph of a linear inequality in two variables is a(n) .
2. ★ **WRITING** Compare the graph of a linear inequality in two variables with the graph of a linear equation in two variables.

EXAMPLE 1
on p. 132
for Exs. 3–6

CHECKING SOLUTIONS Tell whether the given ordered pairs are solutions of the inequality.

3. $x > -7$; $(0, 10)$, $(-8, -5)$
4. $y \leq -5x$; $(3, 2)$, $(-2, 1)$
5. $y \geq -2x + 4$; $(0, 4)$, $(-1, 8)$
6. $2x - y < 3$; $(0, 0)$, $(2, -2)$

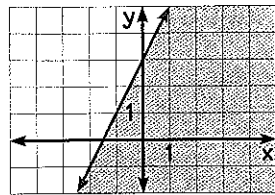
EXAMPLES 2 and 3
on p. 133
for Exs. 7–20

GRAPHING INEQUALITIES Graph the inequality in a coordinate plane.

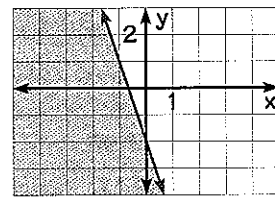
7. $x < 3$
8. $x \geq 6$
9. $y > -2$
10. $-2y \leq 8$
11. $y \leq -2x - 1$
12. $y < 3x + 3$
13. $y > \frac{3}{4}x + 1$
14. $y \geq -\frac{2}{3}x - 2$
15. $2x + y < 6$
16. $x + 4y > -12$
17. $3x - y \geq 1$
18. $2x + 5y \leq -10$

ERROR ANALYSIS Describe and correct the error in graphing the inequality.

19. $y < 2x + 3$



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



21. ★ **MULTIPLE CHOICE** Which ordered pair is *not* a solution of $3x - 5y < 30$?

- (A) (0, 0) (B) (-1, 7) (C) (1, -7) (D) (-5, -5)

EXAMPLE 5

on p. 135
for Exs. 22–28

ABSOLUTE VALUE INEQUALITIES Graph the inequality in a coordinate plane.

22. $y > |x - 1|$

23. $y < |x| + 5$

24. $y > |x + 4| - 3$

25. $y \leq -\frac{1}{2}|x - 2| + 1$

26. $y < 3|x| + 2$

27. $y \geq 2|x - 1| - 4$

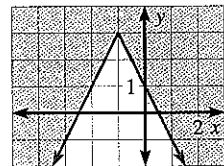
28. ★ **MULTIPLE CHOICE** The graph of which inequality is shown?

(A) $y \leq -2|x + 1| + 3$

(B) $y \geq -2|x - 1| + 3$

(C) $y > -2|x + 1| + 3$

(D) $y \geq -2|x + 1| + 3$



CHECKING SOLUTIONS Tell whether the given ordered pairs are solutions of the inequality.

29. $y \geq -\frac{2}{3}x + \frac{1}{2}$; (-6, 8), (-3, -3)

30. $4.5 + y < 1.6x$; (0.5, 1), (3.8, 0)

31. $0.2x + 0.7y > -1$; (0.5, -1), (-3, -1.5)

32. $\frac{1}{4}x - y > 1$; $(\frac{4}{3}, 0)$, $(\frac{2}{3}, -4)$

GRAPHING INEQUALITIES Graph the inequality in a coordinate plane.

33. $3y < 4.5x + 15$

34. $-1.5y - 2x > 3$

35. $-y - 0.2 > -0.6x$

36. $\frac{2}{3}x + \frac{1}{2}y > 2$

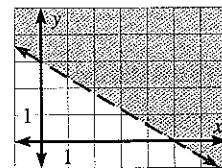
37. $y \geq -\frac{5}{2}|x - 3| - \frac{3}{2}$

38. $2y - 4 \leq -3|x + 2|$

39. ★ **OPEN-ENDED MATH** Write a linear inequality in two variables that has (-1, 3) and (1, 6) as solutions, but does not have (4, 0) as a solution.

40. ★ **WRITING** Explain why it is not helpful when graphing a linear inequality in two variables to choose a test point that lies on the boundary line.

41. ★ **SHORT RESPONSE** Write an inequality for the graph shown. Explain how you came up with the inequality. Then describe a real-life situation that the first-quadrant portion of the graph could represent.



42. **CHALLENGE** Write an absolute value inequality that has exactly one solution in common with $y \geq 2|x - 3| + 5$. The common solution should not be the vertex (3, 5) of the boundary. Explain how you found your inequality.

○ = **WORKED-OUT SOLUTIONS**
on p. WS1

★ = **STANDARDIZED**
TEST PRACTICE

PROBLEM SOLVING

EXAMPLE 4
on p. 134
for Exs. 43–48

- 43. CALLING CARDS** You have a \$20 phone card. Calls made using the card cost \$.03 per minute to destinations within the United States and \$.06 per minute to destinations in Brazil. Write an inequality describing the numbers of minutes you can use for calls to U.S. destinations and to Brazil.

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- 44. RESTAURANT MANAGEMENT** A pizza shop has 300 pounds (4800 ounces) of dough. A small pizza uses 12 ounces of dough and a large pizza uses 18 ounces of dough. Write and graph an inequality describing the possible numbers of small and large pizzas that can be made. Then give three possible solutions.

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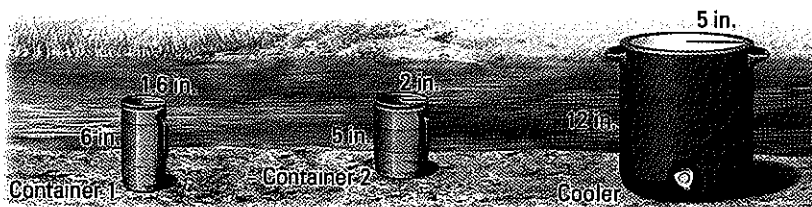
- 45. CRAFTS** Cotton lace costs \$1.50 per yard and linen lace costs \$2.50 per yard. You plan to order at most \$75 of lace for crafts. Write and graph an inequality describing how much of each type of lace you can order. If you buy 24 yards of cotton lace, what are the amounts of linen lace you can buy?

- 46. ★ SHORT RESPONSE** You sell T-shirts for \$15 each and caps for \$10 each. Write and graph an inequality describing how many shirts and caps you must sell to exceed \$1800 in sales. *Explain* how you can modify this inequality to describe how many shirts and caps you must sell to exceed \$600 in *profit* if you make a 40% profit on shirts and a 30% profit on caps.

- 47. MULTI-STEP PROBLEM** On a two week vacation, you and your brother can rent one canoe for \$11 per day or rent two mountain bikes for \$13 each per day. Together, you have \$120 to spend.

- Write and graph an inequality describing the possible numbers of days you and your brother can canoe or bicycle together.
- Give three possible solutions of the inequality from part (a).
- You decide that on one day you will canoe alone and your brother will bicycle alone. Repeat parts (a) and (b) using this new condition.

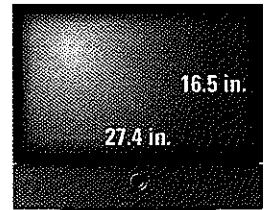
- 48. ★ EXTENDED RESPONSE** While camping, you and a friend filter river water into two cylindrical containers with the radii and heights shown. You then use these containers to fill the water cooler shown.



- Find the volumes of the containers and the cooler in cubic inches.
- Using your results from part (a), write and graph an inequality describing how many times the containers can be filled and emptied into the water cooler without the cooler overflowing.
- Convert the volumes from part (a) to gallons ($1 \text{ in.}^3 \approx 0.00433 \text{ gal}$). Then rewrite the inequality from part (b) in terms of these converted volumes.
- Graph the inequality from part (c). *Compare* the graph with your graph from part (b), and explain why the results make sense.

49. **CHALLENGE** A widescreen television image has a width w and a height h that satisfy the inequality $\frac{w}{h} > \frac{4}{3}$.

- Does the television screen shown at the right meet the requirements of a widescreen image?
- Let d be the length of a diagonal of a television image. Write an inequality describing the possible values of d and h for a widescreen image.



MIXED REVIEW

Look for a pattern in the table. Then write an equation that represents the table. (p. 34)

50.

x	0	1	2	3
y	11	15	19	23

51.

x	0	1	2	3
y	60	45	30	15

PREVIEW

Prepare for
Lesson 3.1
in Exs. 52–57.

Graph the equation. (p. 89)

52. $x + 3y = -6$

53. $4x - 3y = 15$

54. $8x - 6y = 18$

55. $6x + 9y = 18$

56. $-2x - 5y = 20$

57. $-10x + 4y = 20$

Write an equation of the line that satisfies the given conditions. (p. 98)

58. $m = \frac{4}{5}$, passes through (10, -2)

59. $m = -3$, passes through (3, 7)

60. passes through (0, 2) and (5, 8)

61. passes through (4, -1) and (7, -6)

QUIZ for Lessons 2.7–2.8

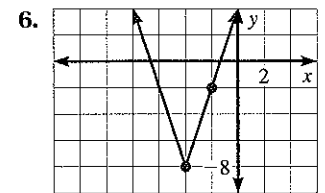
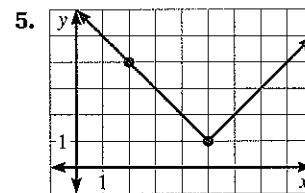
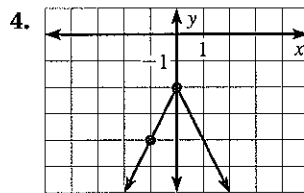
Graph the function. Compare the graph with the graph of $y = |x|$. (p. 123)

1. $y = |x + 7| + 4$

2. $y = -2|x + 10| - 1$

3. $f(x) = \frac{1}{2}|x - 1| - 5$

Write an equation of the graph. (p. 123)



Graph the inequality in a coordinate plane. (p. 132)

7. $y > -2$

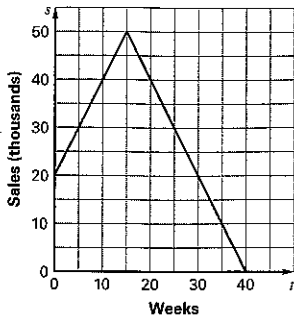
8. $y \leq 3x + 1$

9. $2x - 5y \geq 10$

10. **MINI-CARS** You have a 20 credit gift pass to a mini-car raceway. It takes 2 credits to drive the cars on the Rally track and 3 credits to drive the cars on the Grand Prix track. Write and graph an inequality describing how many times you can race on the two tracks using your gift pass. Then give three possible solutions. (p. 132)

2.7 Problem Solving (pp. 128–129)

37. 50,000 pairs of shoes



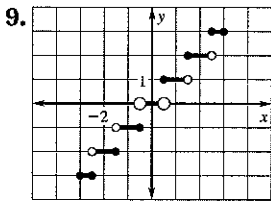
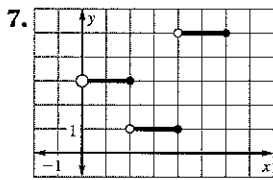
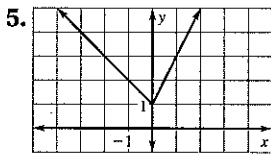
39. $y = -\frac{140}{69}|x - 69| + 140$

41. a.

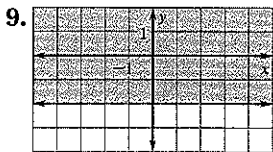
t	0	0.5	1	1.5	2	2.5	3
d	90	60	30	0	30	60	90

b. c. $d = 60|t - 1.5|$;
 $\frac{2}{3} \leq t \leq 2\frac{1}{3}$

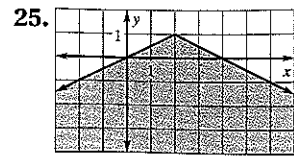
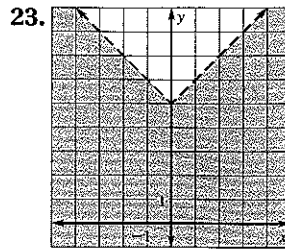
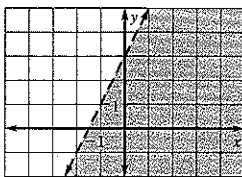
Extension (p. 131) 1. -1 3. $\frac{5}{2}$



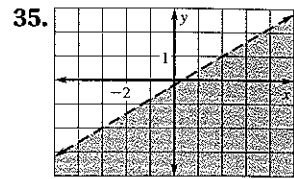
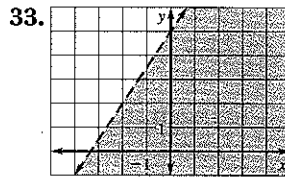
2.8 Skill Practice (pp. 135–136) 1. half-plane 3. solution, not a solution 5. solution, solution



19. The boundary line should be a dashed line.



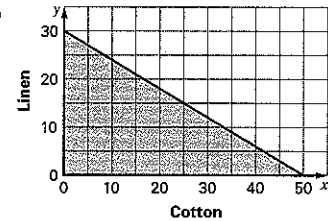
29. solution, not a solution 31. solution, not a solution



39. *Sample answer:* $y > x + 3$ 41. $y > -\frac{3}{5}x + 3$; pick two points on the boundary line to find the slope and then use the point-slope form of an equation to find the equation. The boundary line is dotted, so the inequality does not include points on the boundary. Then choose a point to determine which inequality sign to use. *Sample answer:* You and your sister want to spend at least \$15 on your little brother's birthday. You want to buy him some racecars that cost \$3 each and some building block sets that cost \$5 each.

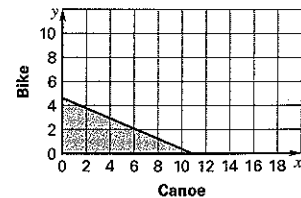
2.8 Problem Solving (pp. 137–138) 43. $0.03x + 0.06y \leq 20$

45. $1.5x + 2.5y \leq 75$



$y \leq 15.6$ yd

47. a. $11x + 26y \leq 120$



b. *Sample answer:* 2 days canoeing and 5 days biking, 3 days canoeing and 2 days biking, 2 days canoeing and 2 days biking

c. $11x + 26y \leq 96$

Sample answer: 1 day canoeing and 3 days biking, 4 days canoeing and 2 days biking, 2 days canoeing and 2 days biking

