# Reading and *Writing* Math

## Study Strategy: Use Your Notes Effectively

Taking notes helps you arrange, organize, and process information from your textbook and class lectures. In addition to taking notes, you need to use your notes before and after class effectively.

**Step 1: Before Class**
- Review your notes from the last class.
- Then preview the next lesson and write down any questions you have.

**Step 2: During Class**
- Write down main ideas.
- If you miss something, leave a blank and keep taking notes. Fill in any holes later.
- Use diagrams and abbreviations. Make sure you will understand any abbreviations later.

**Step 3: After Class**
- Fill in the holes you left during class.
- Highlight or circle the most important ideas, such as vocabulary, formulas, or procedures.
- Use your notes to quiz yourself.

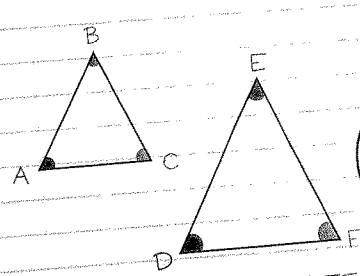10/3    Lesson 2-8    Applications of Proportion

How do I know if figures are similar?

Similar figures—same shape, but maybe not same size

Corresponding sides and angles—same relative position.

Similar figures if corr. sides are proportional and corr. angles are same.

Use the symbol ~ to show figures are sim.

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$
$$m\angle A \cong m\angle D$$
$$m\angle B \cong m\angle E$$
$$m\angle C \cong m\angle F$$

$\triangle ABC \sim \triangle DEF$

### Try This

1. Look at the next lesson in your textbook. Write down some questions you have about the material in that lesson. Leave space between each question so that you can write the answers during the next class.

2. Look at the notes you took during the last class. List three ways you can improve your note-taking skills.

An inequality like $3 + x < 9$ has too many solutions to list. You can use a graph on a number line to show all the solutions.
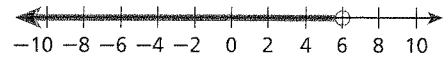


The solutions are shaded and an arrow shows that the solutions continue past those shown on the graph. To show that an endpoint is a solution, draw a solid circle at the number. To show that an endpoint is not a solution, draw an empty circle.
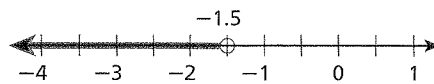
**Know it! Note**

## Graphing Inequalities

| WORDS | ALGEBRA | GRAPH |
|---|---|---|
| All real numbers less than 5 | $x < 5$ |  |
| All real numbers greater than $-1$ | $x > -1$ |  |
| All real numbers less than or equal to $\frac{1}{2}$ | $x \leq \frac{1}{2}$ |  |
| All real numbers greater than or equal to 0 | $x \geq 0$ |  |

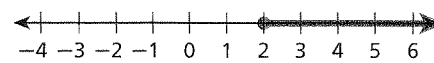**EXAMPLE 2** Graphing Inequalities

Graph each inequality.

**A** $b < -1.5$



Draw an empty circle at $-1.5$.
Shade all the numbers less than $-1.5$ and draw an arrow pointing to the left.

**B** $r \geq 2$



Draw a solid circle at 2.
Shade all the numbers greater than 2 and draw an arrow pointing to the right.

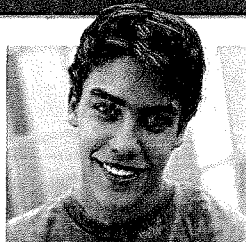**CHECK IT OUT!** Graph each inequality.

**2a.** $c > 2.5$ **2b.** $2^2 - 4 \geq w$ **2c.** $m \leq -3$

## Student to Student / Graphing Inequalities
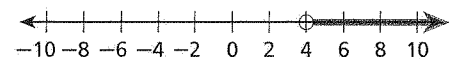
*To know which direction to shade a graph, I write inequalities with the variable on the left side of the inequality symbol. I know that the symbol has to point to the same number after I rewrite the inequality.*

*For example, I write $4 < y$ as $y > 4$.*

*Now the inequality symbol points in the direction that I should draw the shaded arrow on my graph.*



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**3-1**

# Exercises

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**Parent Resources Online**
KEYWORD: MA7 Parent

## GUIDED PRACTICE

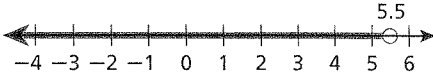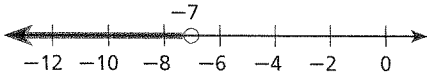**1. Vocabulary** How is a *solution of an inequality* like a solution of an equation?
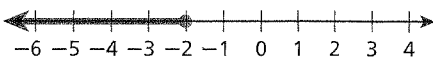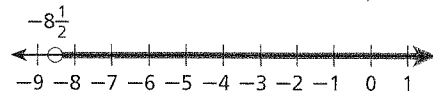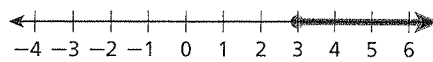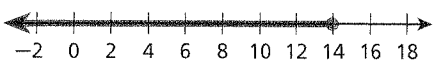
SEE EXAMPLE **1**
p. 170

Describe the solutions of each inequality in words.

**2.** $g + 5 \geq 6$  **3.** $-2 < h + 1$  **4.** $20 > 5t$  **5.** $5 - x \leq 2$

SEE EXAMPLE **2**
p. 171

Graph each inequality.

**6.** $x < -5$  **7.** $c \geq 3\frac{1}{2}$  **8.** $(4 + 2)^3 > m$  **9.** $p \geq \sqrt{17 + 8}$

SEE EXAMPLE **3**
p. 172

Write the inequality shown by each graph.

**10.** 

**11.** 

**12.** 

**13.** 

**14.** 

**15.** 

SEE EXAMPLE **4**
p. 172

Define a variable and write an inequality for each situation. Graph the solutions.

**16.** There must be at least 20 club members present in order to hold a meeting.

**17.** A trainer advises an athlete to keep his heart rate under 140 beats per minute.

## PRACTICE AND PROBLEM SOLVING

**Independent Practice**
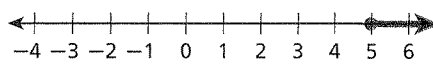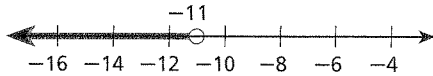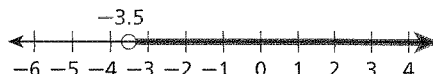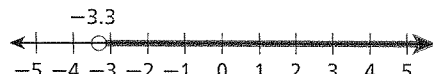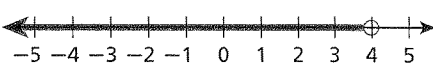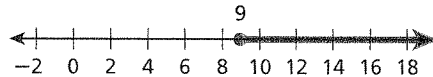
| For Exercises | See Example |
|---|---|
| 18–21 | 1 |
| 22–25 | 2 |
| 26–31 | 3 |
| 32–33 | 4 |

**Extra Practice**

Skills Practice p. S8
Application Practice p. S30

Describe the solutions of each inequality in words.

**18.** $-2t > -8$  **19.** $0 > w - 2$  **20.** $3k > 9$  **21.** $\frac{1}{2}b \leq 6$

Graph each inequality.

**22.** $7 < x$  **23.** $t \leq -\frac{1}{2}$  **24.** $d > 4(5 + 8)$  **25.** $t \leq 3^2 - 2^2$

Write the inequality shown by each graph.

**26.** 

**27.** 

**28.** 

**29.** 

**30.** 

**31.** 

Define a variable and write an inequality for each situation. Graph the solutions.

**32.** The maximum speed allowed on Main Street is 25 miles per hour.

**33.** Applicants must have at least 5 years of experience.

**56. Critical Thinking** Graph all positive integer solutions of the inequality $x < 5$.

**57. Write About It** Explain how to write an inequality that is modeled by a graph. What characteristics do you look for in the graph?

**58. Write About It** You were told in the lesson that the phrase "no more than" means "less than or equal to" and the phrase "at least" means "greater than or equal to."
a. What does the phrase "at most" mean?
b. What does the phrase "no less than" mean?

**59.** Which is NOT a solution of the inequality $5 - 2x \geq -3$?
(A) 0        (B) 2        (C) 4        (D) 5

**60.** Which is NOT a solution of the inequality $3 - x < 2$?
(F) 1        (G) 2        (H) 3        (J) 4

**61.** Which graph represents the solutions of $-2 \leq 1 - t$?
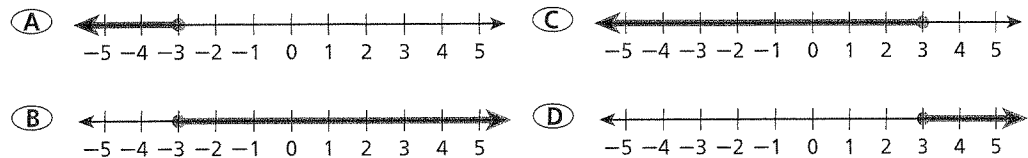


**CHALLENGE AND EXTEND**

Describe the values for $x$ and $y$ that make each inequality true.

**62.** $x + y \leq |x + y|$        **63.** $x^2 < xy$        **64.** $x - y \geq y - x$

Complete each statement. Write < or >.

**65.** If $a > b$, then $b$ ___ $a$.        **66.** If $x > y$ and $y > z$, then $x$ ___ $z$.

**67.** Name a value of $x$ that makes the statement $0.35 < x < 1.27$ true.

**68.** Is $\frac{5}{6}$ a solution of $x < 1$? How many solutions of $x < 1$ are between 0 and 1?

**69. Write About It** Explain how to graph all the solutions of $x \neq 5$.

**SPIRAL REVIEW**

Add or subtract. *(Lesson 1-2)*

**70.** $-7 + 5$        **71.** $6 - (-4)$        **72.** $8 - 13$        **73.** $12 + (-5)$

Simplify each expression. *(Lesson 1-7)*

**74.** $x + 3x$        **75.** $x + (x + 1) + (x + 2)$        **76.** $5 + (x + 3) + 5 + 2(x + 3)$

**77.** There are twice as many girls in Sally's class as boys. Write a rule for the number of girls in Sally's class. Find the number of girls if there are 8 boys. *(Lesson 1-8)*

**78.** A video club charges a \$12 membership fee plus \$2.00 for each movie rental. Write a rule for the cost of renting $x$ videos. Find the cost of renting 3, 7, and 15 videos. *(Lesson 1-8)*

Solve each equation. Check your answer. *(Lesson 2-4)*

**79.** $2b - 6 = b + 3$        **80.** $-3(2 - x) = 5x + 2$        **81.** $2(y + 1) = 2y + 1$

Solve each inequality and graph the solutions.

**C** $0.7 \geq n - 0.4$
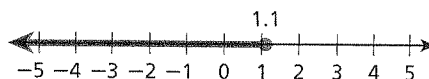
$$0.7 \geq n - 0.4$$
$$\underline{+\,0.4 \qquad +\,0.4}$$
$$1.1 \geq n$$
$$n \leq 1.1$$

*Since 0.4 is subtracted from n, add 0.4 to both sides to undo the subtraction.*



**CHECK IT OUT!** Solve each inequality and graph the solutions.

**1a.** $s + 1 \leq 10$      **1b.** $2\frac{1}{2} > -3 + t$      **1c.** $q - 3.5 < 7.5$

Since there can be an infinite number of solutions to an inequality, it is not possible to check all the solutions. You can check the endpoint and the direction of the inequality symbol.

The solutions of $x + 9 < 15$ are given by $x < 6$.

**Step 1** Check the endpoint.

Substitute 6 for $x$ in the related equation $x + 9 = 15$. The endpoint should be a solution of the equation.

$$x + 9 = 15$$

| $6 + 9$ | 15 |
|---------|----|
| 15 | 15 ✓ |

**Step 2** Check the inequality symbol.

Substitute a number less than 6 for $x$ in the original inequality. The number you choose should be a solution of the inequality.

$$x + 9 < 15$$

| $4 + 9$ | < | 15 |
|---------|---|----|
| 13 | < | 15 ✓ |

**EXAMPLE 2**

PROBLEM SOLVING

### Problem Solving Application

The memory in Tenea's camera phone allows her to take up to 20 pictures. Tenea has already taken 16 pictures. Write, solve, and graph an inequality to show how many more pictures Tenea could take.

**Understand the Problem**

The **answer** will be an inequality and a graph that show all the possible numbers of pictures that Tenea can take.

List the important information:
- Tenea can take up to, or *at most*, 20 pictures.
- Tenea has taken 16 pictures already.

**Make a Plan**

Write an inequality.

Let $p$ represent the remaining number of pictures Tenea can take.

| Number taken | plus | number remaining | is at most | 20 pictures. |
|:---:|:---:|:---:|:---:|:---:|
| 16 | + | $p$ | $\leq$ | 20 |

## THINK AND DISCUSS

**1.** Show how to check your solution to Example 1B.

**2.** Explain how the Addition and Subtraction Properties of Inequality are like the Addition and Subtraction Properties of Equality.

**3.** **GET ORGANIZED** Copy and complete the graphic organizer. In each box, write an inequality that you must use the specified property to solve. Then solve and graph the inequality.
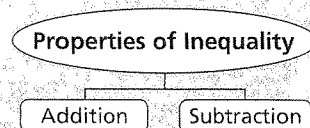
Properties of Inequality
└── Addition    Subtraction

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## GUIDED PRACTICE

SEE EXAMPLE **1**
p. 176

Solve each inequality and graph the solutions.

**1.** $12 < p + 6$      **2.** $w + 3 \geq 4$      **3.** $-5 + x \leq -20$      **4.** $z + 2 > -11$

SEE EXAMPLE **2**
p. 177

**5.** **Health** For adults, the maximum safe water temperature in a spa is 104 °F. The water temperature in Bill's spa is 102 °F. The temperature is increased by $t$ °F. Write, solve, and graph an inequality to show the values of $t$ for which the water temperature is still safe.

SEE EXAMPLE **3**
p. 178

**6.** **Consumer Economics** A local restaurant will deliver food to your house if the purchase amount of your order is at least $25.00. The total for part of your order is $17.95. Write and solve an inequality to determine how much more you must spend for the restaurant to deliver your order.

## PRACTICE AND PROBLEM SOLVING

Solve each inequality and graph the solutions.

**7.** $a - 3 \geq 2$      **8.** $2.5 > q - 0.8$      **9.** $-45 + x < -30$      **10.** $r + \frac{1}{4} \leq \frac{3}{4}$

**11.** **Engineering** The maximum load for a certain elevator is 2000 pounds. The total weight of the passengers on the elevator is 1400 pounds. A delivery man who weighs 243 pounds enters the elevator with a crate of weight $w$. Write, solve, and graph an inequality to show the values of $w$ that will not exceed the weight limit of the elevator.

**12.** **Transportation** The gas tank in Mindy's car holds at most 15 gallons. She has already filled the tank with 7 gallons of gas. She will continue to fill the tank with $g$ gallons more. Write and solve an inequality that shows all values of $g$ that Mindy can add to the car's tank.

Write an inequality to represent each statement. Solve the inequality and graph the solutions.

**13.** Ten less than a number $x$ is greater than 32.

**14.** A number $n$ increased by 6 is less than or equal to 4.

**15.** A number $r$ decreased by 13 is at most 15.

**36.** Which is a reasonable solution of $4.7367 + p < 20.1784$?

   Ⓐ 15     Ⓑ 16     Ⓒ 24     Ⓓ 25

**37.** Which statement can be modeled by $x + 3 \le 12$?

  Ⓕ Sam has 3 bottles of water. Together, Sam and Dave have at most 12 bottles of water.

  Ⓖ Jennie sold 3 cookbooks. To earn a prize, Jennie must sell at least 12 cookbooks.

  Ⓗ Peter has 3 baseball hats. Peter and his brothers have fewer than 12 baseball hats.

  Ⓙ Kathy swam 3 laps in the pool this week. She must swim more than 12 laps.

**38.** Which graph represents the solutions of $p + 3 < 1$?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 
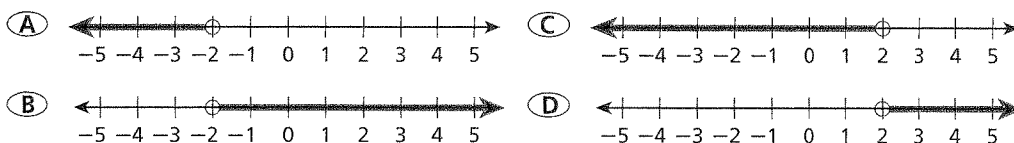
**39.** Which inequality does NOT have the same solutions as $n + 12 \le 26$?

  Ⓕ $n \le 14$    Ⓖ $n + 6 \le 20$   Ⓗ $10 \ge n - 4$   Ⓙ $n - 12 \le 14$

## CHALLENGE AND EXTEND

Solve each inequality and graph the solutions.

**40.** $6\frac{9}{10} \ge 4\frac{4}{5} + x$     **41.** $r - 1\frac{2}{5} \le 3\frac{7}{10}$     **42.** $6\frac{2}{3} + m > 7\frac{1}{6}$

Determine whether each statement is sometimes, always, or never true. Explain.

**43.** $a + b > a - b$

**44.** If $a > c$, then $a + b > c + b$.

**45.** If $a > b$ and $c > d$, then $a + c > b + d$.

**46.** If $x + b > c$ and $x > 0$ have the same solutions, what is the relationship between $b$ and $c$?

## SPIRAL REVIEW

Solve each equation for the indicated variable. *(Lesson 2-5)*

**47.** $2x + 3y = 9$ for $y$   **48.** $P = 4s$ for $s$   **49.** $2 + ab = c$ for $a$

**50.** $p + e = f$ for $e$   **51.** $2s + k = 11$ for $k$   **52.** $5m + n = 0$ for $m$

Find the value of $x$ in each diagram of similar figures. *(Lesson 2-8)*

**53.**       **54.** 
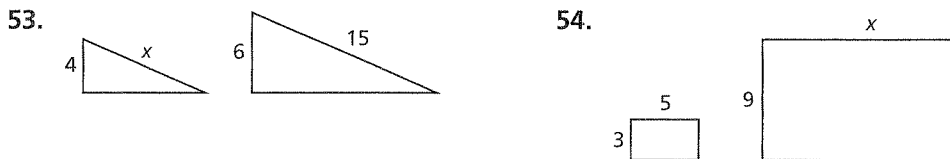
Write the inequality shown by each graph. *(Lesson 3-1)*

**55.**    **56.**

Solve each inequality and graph the solutions.

**B** $\frac{2}{3}r < 6$

$$\frac{2}{3}r < 6 \qquad \text{\textit{Since r is multiplied by }} \frac{2}{3}, \text{ \textit{multiply both sides by}}$$
$$\qquad\qquad\qquad \text{\textit{the reciprocal of }} \frac{2}{3}.$$
$$\frac{3}{2}\left(\frac{2}{3}r\right) < \frac{3}{2}(6)$$
$$r < 9$$



Number line graphed from $-8$ to $12$ with an open circle at $9$.

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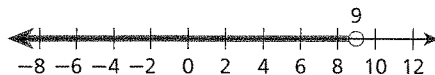
**CHECK IT OUT!** Solve each inequality and graph the solutions.

**1a.** $4k > 24$ **1b.** $-50 \geq 5q$ **1c.** $\frac{3}{4}g > 27$

What happens when you multiply or divide both sides of an inequality by a negative number?

Look at the number line below.



Number line with marks at $-6$, $-2$, $0$, $2$, $6$.

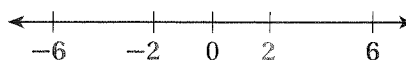| | | |
|---|---|---|
| $2 < 6$ | | $6 > -2$ |
| $-2 \quad -6$ | *Multiply both sides by $-1$.* | $-6 \quad 2$ |
| $-2 > -6$ | *Use the number line to determine the direction of the inequality.* | $-6 < 2$ |

*Multiply both sides by $-1$.*

*Use the number line to determine the direction of the inequality.*

Notice that when you multiply (or divide) both sides of an inequality by a negative number, you must reverse the inequality symbol. This means there is another set of properties of inequality for multiplying or dividing by a negative number.

**Know it! Note**

### Properties of Inequality

**Multiplication and Division by Negative Numbers**

| WORDS | NUMBERS | ALGEBRA |
|---|---|---|
| **Multiplication** If you multiply both sides of an inequality by the same *negative* number, you must reverse the inequality symbol for the statement to still be true. | $8 > 4$ $8(-2) < 4(-2)$ $-16 < -8$ | If $a > b$ and $c < 0$, then $ac < bc$. |
| **Division** If you divide both sides of an inequality by the same *negative* number, you must reverse the inequality symbol for the statement to still be true. | $12 > 4$ $\frac{12}{-4} < \frac{4}{-4}$ $-3 < -1$ | If $a > b$ and $c < 0$, then $\frac{a}{c} < \frac{b}{c}$. |

These properties are also true for inequalities that use the symbols $<$, $\geq$, and $\leq$.

## 3-3 Exercises

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## GUIDED PRACTICE

**Solve each inequality and graph the solutions.**

SEE EXAMPLE **1**
p. 182

1. $3b > 27$
2. $-40 \geq 8b$
3. $\frac{d}{3} > 6$
4. $24d \leq 6$
5. $1.1m \leq 1.21$
6. $\frac{2}{3}k > 6$
7. $9s > -18$
8. $\frac{4}{5} \geq \frac{r}{2}$

SEE EXAMPLE **2**
p. 184

9. $-2x < -10$
10. $\frac{b}{-2} \geq 8$
11. $-3.5n < 1.4$
12. $4 > -8g$
13. $\frac{d}{-6} < \frac{1}{2}$
14. $-10h \geq -6$
15. $12 > \frac{t}{-6}$
16. $-\frac{1}{2}m \geq -7$

SEE EXAMPLE **3**
p. 184

17. **Travel** Tom saved $550 to go on a school trip. The cost for a hotel room, including tax, is $80 per night. What are the possible numbers of nights Tom can stay at the hotel?

## PRACTICE AND PROBLEM SOLVING

**Independent Practice**

| For Exercises | See Example |
|---|---|
| 18–29 | 1 |
| 30–41 | 2 |
| 42 | 3 |

**Extra Practice**
Skills Practice p. S8
Application Practice p. S30

**Solve each inequality and graph the solutions.**

18. $10 < 2t$
19. $\frac{1}{3}j \leq 4$
20. $-80 < 8c$
21. $21 > 3d$
22. $\frac{w}{4} \geq -2$
23. $\frac{h}{4} \leq \frac{2}{7}$
24. $6y < 4.2$
25. $12c \leq -144$
26. $\frac{4}{5}x \geq \frac{2}{5}$
27. $6b \geq \frac{3}{5}$
28. $-25 > 10p$
29. $\frac{b}{8} \leq -2$
30. $-9a > 81$
31. $\frac{1}{2} < \frac{r}{-3}$
32. $-6p > 0.6$
33. $\frac{y}{-4} > -\frac{1}{2}$
34. $-\frac{1}{6}f < 5$
35. $-2.25t < -9$
36. $24 \leq -10w$
37. $-11z > 121$
38. $\frac{3}{5} < \frac{f}{-5}$
39. $-k \geq 7$
40. $-2.2b < -7.7$
41. $16 \geq -\frac{4}{3}p$

42. **Camping** The rope Roz brought with her camping gear is 54 inches long. Roz needs to cut shorter pieces of rope that are each 18 inches long. What are the possible number of pieces Roz can cut?

**Solve each inequality and graph the solutions.**

43. $-8x < 24$
44. $3t \leq 24$
45. $\frac{1}{4}x < 5$
46. $\frac{4}{5}p \geq -24$
47. $54 \leq -9p$
48. $3t > -\frac{1}{2}$
49. $-\frac{3}{4}b > -\frac{3}{2}$
50. $216 > 3.6r$

**Write an inequality for each statement. Solve the inequality and graph the solutions.**

51. The product of a number and 7 is not less than 21.
52. The quotient of $h$ and $-6$ is at least 5.
53. The product of $-\frac{4}{5}$ and $b$ is at most $-16$.
54. Ten is no more than the quotient of $t$ and 4.

55. **Write About It** Explain how you know whether to reverse the inequality symbol when solving an inequality.

56. **Geometry** The area of a rectangle is at most 21 square inches. The width of the rectangle is 3.5 inches. What are the possible measurements for the length of the rectangle?

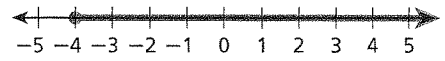**67.** Which inequality does NOT have the same solutions as $-\frac{2}{3}y > 4$?

(A) $12 < -2y$

(C) $-\frac{3}{4}y > \frac{9}{2}$

(B) $\frac{y}{2} < -12$

(D) $-3y > 18$

**68.** The solutions of which inequality are NOT represented by the following graph?


$-5\ -4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4\ \ 5$

(F) $\frac{x}{2} \geq -2$

(H) $3x \geq -12$

(G) $-5x \geq 20$

(J) $-7x \leq 28$

**69.** Which inequality can be used to find the number of 39-cent stamps you can purchase for $4.00?

(A) $0.39s \geq 4.00$

(C) $\frac{s}{0.39} \leq 4.00$

(B) $0.39s \leq 4.00$

(D) $\frac{4.00}{0.39} \leq s$

**70. Short Response** Write three different inequalities that have the same solutions as $x > 4$. Show your work and explain each step.

## CHALLENGE AND EXTEND

Solve each inequality.

**71.** $2\frac{1}{3} \leq -\frac{5}{6}g$     **72.** $\frac{2x}{3} < 8.25$     **73.** $2\frac{5}{8}m > \frac{7}{10}$     **74.** $3\frac{3}{5}f \geq 14\frac{2}{5}$

**75. Estimation** What is the greatest possible integer solution of the inequality $3.806x < 19.902$?

**76. Critical Thinking** The Transitive Property of Equality states that if $a = b$ and $b = c$, then $a = c$. Is there a Transitive Property of Inequality using the symbol $<$? Give an example to support your answer.

**77. Critical Thinking** The Symmetric Property of Equality states that if $a = b$, then $b = a$. Is there a Symmetric Property of Inequality? Give an example to support your answer.

## SPIRAL REVIEW

Write the power represented by each geometric model. *(Lesson 1-4)*

**78.** 

**79.** 

**80.** 
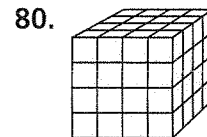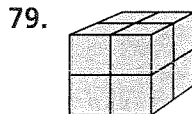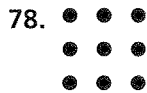
Find each unit rate. *(Lesson 2-7)*

**81.** Twelve gallons of gas cost $22.68. Find the unit rate in dollars per gallon.

**82.** A tree grows four feet in six years. Find the unit rate in feet per year.

**83.** A student types 105 words in 3 minutes. Find the unit rate in words per minute.

Solve each inequality and graph the solutions. *(Lesson 3-2)*

**84.** $x + 5 \geq 3$     **85.** $t - \frac{1}{4} < \frac{3}{4}$     **86.** $4 > x - 1$     **87.** $6 > b - 8$

# READY TO GO ON?

## Quiz for Lessons 3-1 Through 3-3

### ✓ 3-1  Graphing and Writing Inequalities

Describe the solutions of each inequality in words.

**1.** $-2 < r$    **2.** $t - 1 \leq 7$    **3.** $2s \geq 6$    **4.** $4 > 5 + x$
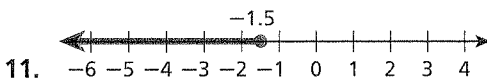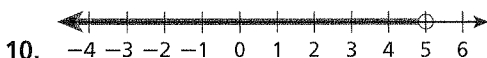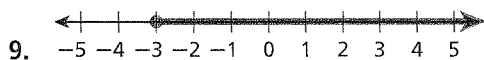
Graph each inequality.

**5.** $x > -2$    **6.** $m \leq 1\frac{1}{2}$    **7.** $g < \sqrt{8+1}$    **8.** $h \geq 2^3$

Write the inequality shown by each graph.

**9.**


**10.**


**11.**


Write an inequality for each situation and graph the solutions.

**12.** You must purchase at least 5 tickets to receive a discount.

**13.** Children under 13 are not admitted to certain movies without an adult.

**14.** A cell phone plan allows up to 250 free minutes per month.

### ✓ 3-2  Solving One-Step Inequalities by Adding or Subtracting

Solve each inequality and graph the solutions.

**15.** $k + 5 \leq 7$    **16.** $4 > p - 3$    **17.** $r + 8 \geq -12$    **18.** $-3 + p < -6$

**19.** Allie must sell at least 50 gift baskets for the band fund-raiser. She already sold 36 baskets. Write and solve an inequality to determine how many more baskets Allie must sell for the fund-raiser.

**20.** Dante has at most $12 to spend on entertainment each week. So far this week, he spent $7.50. Write and solve an inequality to determine how much money Dante can spend on entertainment the rest of the week.

### ✓ 3-3  Solving One-Step Inequalities by Multiplying or Dividing

Solve each inequality and graph the solutions.

**21.** $-4x < 8$    **22.** $\frac{d}{3} \geq -3$    **23.** $\frac{3}{4}t \leq 12$    **24.** $8 > -16c$

**25.** A spool of ribbon is 80 inches long. Riley needs to cut strips of ribbon that are 14 inches long. What are the possible numbers of strips that Riley can cut?

To solve more complicated inequalities, you may first need to simplify the expressions on one or both sides by using the order of operations, combining like terms, or using the Distributive Property.

**EXAMPLE 2** **Simplifying Before Solving Inequalities**

Solve each inequality and graph the solutions.
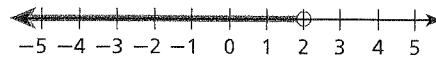
**A** $-4 + (-8) < -5c - 2$

$$-12 < -5c - 2$$

$$\underline{\phantom{-12} + 2 \qquad + 2}$$

$$-10 < -5c$$

$$\frac{-10}{-5} > \frac{-5c}{-5}$$

$$2 > c \text{ (or } c < 2)$$

*Combine like terms. Since 2 is subtracted from $-5c$, add 2 to both sides to undo the subtraction.*

*Since c is multiplied by $-5$, divide both sides by $-5$ to undo the multiplication. Change $<$ to $>$.*



**B** $-3(3 - x) < 4^2$

$$-3(3 - x) < 4^2$$

$$-3(3) - (-3)x < 4^2$$

$$-9 + 3x < 4^2$$

$$-9 + 3x < 16$$

$$-9 + 3x < 16$$

$$\underline{+9 \qquad\qquad +9}$$

$$3x < 25$$

$$\frac{3x}{3} < \frac{25}{3}$$

$$x < 8\frac{1}{3}$$

*Distribute $-3$ on the left side.*

*Simplify the right side.*
*Since $-9$ is added to $3x$, add 9 to both sides to undo the addition.*
*Since x is multiplied by 3, divide both sides by 3 to undo the multiplication.*
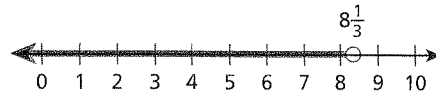


**C** $\frac{4}{5}x + \frac{1}{2} > \frac{3}{5}$

$$10\left(\frac{4}{5}x + \frac{1}{2}\right) > 10\left(\frac{3}{5}\right)$$

$$10\left(\frac{4}{5}x\right) + 10\left(\frac{1}{2}\right) > 10\left(\frac{3}{5}\right)$$

$$8x + 5 > 6$$

$$\underline{\qquad -5 \quad -5}$$

$$8x \qquad > 1$$

$$\frac{8x}{8} > \frac{1}{8}$$

$$x > \frac{1}{8}$$

*Multiply both sides by 10, the LCD of the fractions.*

*Distribute 10 on the left side.*

*Since 5 is added to $8x$, subtract 5 from both sides to undo the addition.*

*Since x is multiplied by 8, divide both sides by 8 to undo the multiplication.*
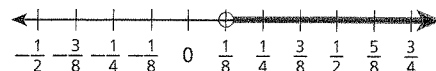


**CHECK IT OUT!** Solve each inequality and graph the solutions.

**2a.** $2m + 5 > 5^2$ **2b.** $3 + 2(x + 4) > 3$ **2c.** $\frac{5}{8} < \frac{3}{8}x - \frac{1}{4}$

# 3-4 Exercises

go.hrw.com
**Homework Help Online**
KEYWORD: MA7 3-4
**Parent Resources Online**
KEYWORD: MA7 Parent

## GUIDED PRACTICE

**Solve each inequality and graph the solutions.**

SEE EXAMPLE **1**
p. 190

**1.** $2m + 1 > 13$    **2.** $2d + 21 \leq 11$    **3.** $6 \leq -2x + 2$    **4.** $4c - 7 > 5$

**5.** $\dfrac{4 + x}{3} > -4$    **6.** $1 < 0.2x - 0.7$    **7.** $\dfrac{3 - 2x}{3} \leq 7$    **8.** $2x + 5 \geq 2$

SEE EXAMPLE **2**
p. 191

**9.** $4(x + 2) > 6$    **10.** $\dfrac{1}{4}x + \dfrac{2}{3} < \dfrac{3}{4}$    **11.** $4 - x + 6^2 \geq 21$

**12.** $4 - x > 3(4 - 2)$    **13.** $0.2(x - 10) > -1.8$    **14.** $3(j + 41) \leq 35$

SEE EXAMPLE **3**
p. 192

**15. Business** A sales representative is given a choice of two paycheck plans. One choice includes a monthly base pay of $300 plus 10% commission on his sales. The second choice is a monthly salary of $1200. For what amount of sales would the representative make more money with the first plan?

## PRACTICE AND PROBLEM SOLVING

**Independent Practice**

| For Exercises | See Example |
|---|---|
| 16–27 | 1 |
| 28–36 | 2 |
| 37 | 3 |

**Extra Practice**
Skills Practice p. S9
Application Practice p. S30

**Solve each inequality and graph the solutions.**

**16.** $4r - 9 > 7$    **17.** $3 \leq 5 - 2x$    **18.** $\dfrac{w + 3}{2} > 6$    **19.** $11w + 99 < 77$

**20.** $9 \geq \dfrac{1}{2}v + 3$    **21.** $-4x - 8 > 16$    **22.** $8 - \dfrac{2}{3}z \leq 2$    **23.** $f + 2\dfrac{1}{2} < -2$

**24.** $\dfrac{3n - 8}{5} \geq 2$    **25.** $-5 > -5 - 3w$    **26.** $10 > \dfrac{5 - 3p}{2}$    **27.** $2v + 1 > 2\dfrac{1}{3}$

**28.** $4(x + 3) > -24$    **29.** $4 > x - 3(x + 2)$    **30.** $-18 \geq 33 - 3h$

**31.** $-2 > 7x - 2(x - 4)$    **32.** $9 + (9)^2 > 10x - x$    **33.** $2a - (-3)^2 \geq 13$

**34.** $6 - \dfrac{x}{3} + 1 > \dfrac{2}{3}$    **35.** $12(x - 3) + 2x > 6$    **36.** $15 \geq 19 + 2(q - 18)$

**37. Communications** One cell phone company offers a plan that costs $29.99 and includes unlimited night and weekend minutes. Another company offers a plan that costs $19.99 and charges $0.35 per minute during nights and weekends. For what numbers of night and weekend minutes does the second company's plan cost more than the first company's plan?

**Solve each inequality and graph the solutions.**

**38.** $-12 > -4x - 8$    **39.** $5x + 4 \leq 14$    **40.** $\dfrac{2}{3}x - 5 > 7$

**41.** $x - 3x > 2 - 10$    **42.** $5 - x - 2 > 3$    **43.** $3 < 2x - 5(x + 3)$

**44.** $\dfrac{1}{6} - \dfrac{2}{3}m \geq \dfrac{1}{4}$    **45.** $4 + (r + 2) > 3 + 5$    **46.** $0.3 - 0.5n + 1 \geq 0.4$

**47.** $6^2 > 4(x + 2)$    **48.** $-4 + 2n + 4n > 7 + 2^2$    **49.** $\dfrac{1}{4}(p - 10) \geq 6 - 4$

**50.** Use the inequality $-4t - 8 \leq 12$ to fill in the missing numbers.

  **a.** $t \geq \blacksquare$    **b.** $t + 4 \geq \blacksquare$    **c.** $t - \blacksquare \geq 0$

  **d.** $t + 10 \geq \blacksquare$    **e.** $3t \geq \blacksquare$    **f.** $\dfrac{t}{\blacksquare} \geq -5$

**62. Critical Thinking** What is the least whole number that is a solution of $4r - 4.9 > 14.95$?

**63. Write About It** Describe two sets of steps to solve $2(x + 3) > 10$.

**64.** What are the solutions of $3y > 2x + 4$ when $y = 6$?

    (A) $7 > x$      (B) $x > 7$      (C) $x > 11$      (D) $11 > x$

**65.** Cecilia has $30 to spend at a carnival. Admission costs $5.00, lunch will cost $6.00, and each ride ticket costs $1.25. Which inequality represents the number of ride tickets $x$ that Cecilia can buy?

    (F) $30 - (5 - 6) + 1.25x \le 30$      (H) $30 - (5 + 6) \le 1.25x$

    (G) $5 + 6 + 1.25x \le 30$      (J) $30 + 1.25x \le 5 + 6$

**66.** Which statement is modeled by $2p + 5 < 11$?

    (A) The sum of 5 and 2 times $p$ is at least 11.

    (B) Five added to the product of 2 and $p$ is less than 11.

    (C) Two times $p$ plus 5 is at most 11.

    (D) The product of 2 and $p$ added to 5 is 11.

**67. Gridded Response** A basketball team scored 8 points more in its second game than in its first. In its third game, the team scored 42 points. The total number of points scored in the three games was more than 150. What is the least number of points the team might have scored in its *second* game?

## CHALLENGE AND EXTEND

Solve each inequality and graph the solutions.

**68.** $3(x + 2) - 6x + 6 \le 0$      **69.** $-18 > -(2x + 9) - 4 + x$      **70.** $\dfrac{2 + x}{2} - (x - 1) > 1$

Write an inequality for each statement. Graph the solutions.

**71.** $x$ is a positive number.      **72.** $x$ is a negative number.

**73.** $x$ is a nonnegative number.      **74.** $x$ is not a positive number.

**75.** $x$ times negative 3 is positive.      **76.** The opposite of $x$ is greater than 2.

## SPIRAL REVIEW

Find each root. *(Lesson 1-5)*

**77.** $\sqrt{49}$      **78.** $-\sqrt{144}$      **79.** $\sqrt{\dfrac{4}{9}}$

**80.** $\sqrt{196}$      **81.** $\sqrt[3]{-729}$      **82.** $\sqrt{10,000}$

**83.** Video rental store A charges a membership fee of $25 and $2 for each movie rental. Video rental store B charges a membership fee of $10 and $2.50 for each movie. Find the number of movie rentals for which both stores' charges are the same. *(Lesson 2-4)*

Solve each inequality and graph the solutions. *(Lesson 3-3)*

**84.** $2x < -8$      **85.** $\dfrac{a}{-2} \le -3$      **86.** $\dfrac{1}{4} < \dfrac{t}{12}$

EXAMPLE 2

**Business Application**

The *Daily Info* charges a fee of $650 plus $80 per week to run an ad. The *People's Paper* charges $145 per week. For how many weeks will the total cost at *Daily Info* be less expensive than the cost at *People's Paper*?

Let $w$ be the number of weeks the ad runs in the paper.

| *Daily Info* fee | plus | $80 per week | times | number of weeks | is less expensive than | *People's Paper* charge per week | times | number of weeks. |
|---|---|---|---|---|---|---|---|---|
| $650 | + | $80 | • | $w$ | < | $145 | • | $w$ |

$$650 + 80w < 145w$$
$$\underline{-80w \qquad -80w}$$   Subtract 80w from both sides.
$$650 \qquad < \quad 65w$$   Since w is multiplied by 65, divide both sides by 65 to undo the multiplication.
$$\frac{650}{65} < \frac{65w}{65}$$
$$10 < w$$

The total cost at *Daily Info* is less than the cost at *People's Paper* if the ad runs for more than 10 weeks.

**CHECK IT OUT!**

2. A-Plus Advertising charges a fee of $24 plus $0.10 per flyer to print and deliver flyers. Print and More charges $0.25 per flyer. For how many flyers is the cost at A-Plus Advertising less than the cost at Print and More?

You may need to simplify one or both sides of an inequality before solving it. Look for like terms to combine and places to use Distributive Property.

EXAMPLE 3

**Simplifying Each Side Before Solving**

Solve each inequality and graph the solutions.

**A** $6(1 - x) < 3x$

$$6(1 - x) < 3x$$   Distribute 6 on the left side of the inequality.
$$6(1) - 6(x) < 3x$$
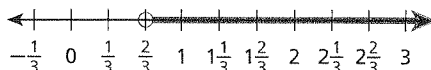$$6 - 6x < 3x$$   Add 6x to both sides so that the coefficient of x is positive.
$$\underline{+6x \quad +6x}$$
$$6 \qquad < 9x$$
$$\frac{6}{9} < \frac{9x}{9}$$   Since x is multiplied by 9, divide both sides by 9 to undo the multiplication.
$$\frac{2}{3} < x$$

## THINK AND DISCUSS

**1.** Explain how you would collect the variable terms to solve the inequality $5c - 4 > 8c + 2$.

**2. GET ORGANIZED** Copy and complete the graphic organizer. In each box, give an example of an inequality of the indicated type.

Solutions of Inequalities with Variables on Both Sides

All real numbers | No solutions

---

## 3-5 Exercises

### GUIDED PRACTICE

SEE EXAMPLE **1**
p. 196

Solve each inequality and graph the solutions.

**1.** $2x > 4x - 6$

**2.** $7y + 1 \le y + 5$

**3.** $27x + 33 > 58x - 29$

**4.** $-3r < 10 + r$

**5.** $5c - 4 > 8c + 2$

**6.** $4.5x + 3.8 \ge 1.5x + 2.3$

SEE EXAMPLE **2**
p. 197

**7. School** The school band will sell pizzas to raise money for new uniforms. The supplier charges $100 plus $4 per pizza. If the band members sell the pizzas for $7 each, how many pizzas will they have to sell to make a profit?

SEE EXAMPLE **3**
p. 197

Solve each inequality and graph the solutions.

**8.** $5(4 + x) \le 3(2 + x)$

**9.** $-4(3 + p) > 5(p + 1)$

**10.** $2(6 + x) < 4x$

**11.** $4x > 3(7 - x)$

**12.** $\frac{1}{2}f + \frac{3}{4} \ge \frac{1}{4}f$

**13.** $-36.72 + 5.65t < 0.25t$

SEE EXAMPLE **4**
p. 198

Solve each inequality.

**14.** $2(x + 2) \le -2(1 + x)$

**15.** $4(y + 1) < 4y + 2$

**16.** $4v + 1 < 4v + 7$

**17.** $b + 4 \ge b + 6$

**18.** $3(x - 5) > 3x$

**19.** $2k + 7 \ge 2(k + 14)$

### PRACTICE AND PROBLEM SOLVING

Solve each inequality and graph the solutions.

**20.** $3x \le 5x + 8$

**21.** $9y + 3 > 4y - 7$

**22.** $1.5x + 1.2 < 3.1x + 2.8$

**23.** $7 + 4b \ge 3b$

**24.** $7 - 5t < 4t + 2$

**25.** $2.8m - 5.2 > 0.8m + 4.8$

**26. Geometry** For what values of $x$ is the area of the rectangle greater than the area of the triangle?

rectangle: $x + 2$ by $12$

triangle: base $x + 16$, height $10$

**Write an inequality to represent each relationship. Solve your inequality.**

**52.** Four more than twice a number is greater than two-thirds of the number.

**53.** Ten less than five times a number is less than six times the number decreased by eight.

**54.** The sum of a number and twenty is less than four times the number decreased by one.

**55.** Three-fourths of a number is greater than or equal to five less than the number.

**56. Entertainment** Use the table to determine how many movies you would have to rent for Video View to be less expensive than Movie Place.

|  | Membership Fee ($) | Cost per Rental ($) |
|---|---|---|
| Movie Place | None | 2.99 |
| Video View | 19.99 | 1.99 |

**57. Geometry** In an acute triangle, all angles measure less than 90°. Also, the sum of the measures of any two angles is greater than the measure of the third angle. Can the measures of an acute triangle be $x$, $x - 1$, and $2x$? Explain.

**58. Write About It** Compare the steps you would follow to solve an inequality to the steps you would follow to solve an equation.

**59. Critical Thinking** How can you tell just by looking at the inequality $x > x + 1$ that it has no solutions?

**60. ///ERROR ANALYSIS///** Two students solved the inequality $5x < 3 - 4x$. Which is incorrect? Explain the error.
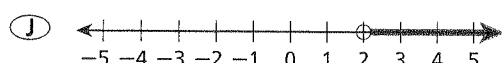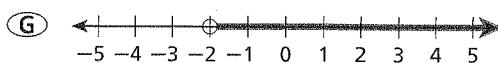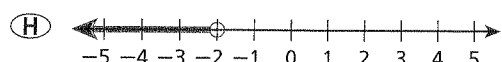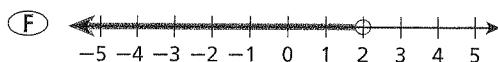
Ⓐ
$$5x < 3 - 4x$$
$$\underline{+ 4x \qquad + 4x}$$
$$9x < 3$$
$$x < \frac{1}{3}$$

Ⓑ
$$5x < 3 - 4x$$
$$\underline{- 4x \qquad - 4x}$$
$$x < 3$$

**TEST PREP**

**61.** If $a - b > a + b$, which statement is true?
  Ⓐ The value of $a$ is positive.
  Ⓑ The value of $b$ is positive.
  Ⓒ The value of $a$ is negative.
  Ⓓ The value of $b$ is negative.

**62.** If $-a < b$, which statement is always true?
  Ⓕ $a < b$      Ⓖ $a > b$      Ⓗ $a < -b$      Ⓙ $a > -b$

**63.** Which is a solution of the inequality $7(2 - x) > 4(x - 2)$?
  Ⓐ $-2$          Ⓑ $2$          Ⓒ $4$          Ⓓ $7$

**64.** Which is the graph of $-5x < -2x - 6$?
  Ⓕ ![number line -5 to 5, open circle at 2, arrow right]
  Ⓗ ![number line -5 to 5, open circle at -2, arrow left]
  Ⓖ ![number line -5 to 5, open circle at -2, arrow right]
  Ⓙ ![number line -5 to 5, open circle at 2, arrow right]

# Algebra LAB
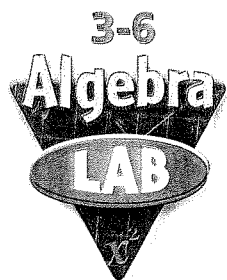
# Truth Tables and Compound Statements

A compound statement is formed by combining two or more simple statements. A compound statement is either true or false depending on whether its simple statements are true or false.

*Use with Lesson 3-6*

## Activity 1

• Let *P* be "Cindy is at least 17 years old."    • Let *Q* be "Cindy has a driver's license."

| If... | then *P* is | and *Q* is | so *P* AND *Q* is |
|---|---|---|---|
| Cindy is 18 years old. Cindy has a driver's license. | True | True | True |
| Cindy is 17 years old. Cindy does not have a driver's license. | True | False | False |
| Cindy is 16 years old. Cindy has a driver's license. | False | True | False |
| Cindy is 15 years old. Cindy does not have a driver's license. | False | False | False |

*P* **AND** *Q* is true when _____?_____.

## Try This

**For each pair of simple statements, tell whether *P* AND *Q* is true or false.**

**1.** *P:* Many birds can fly; *Q:* A zebra is an animal.

## Activity 2

• Let *P* be "Paul plays tennis."    • Let *Q* be "Paul has brown eyes."

| If... | then *P* is | and *Q* is | so *P* OR *Q* is |
|---|---|---|---|
| Paul plays tennis. Paul has brown eyes. | True | True | True |
| Paul plays tennis. Paul has green eyes. | True | False | True |
| Paul does not play tennis. Paul has brown eyes. | False | True | True |
| Paul does not play tennis. Paul has green eyes. | False | False | False |

*P* **OR** *Q* is true when _____?_____.

## Try This

**For each pair of simple statements, tell whether *P* OR *Q* is true or false.**

**2.** *P:* The number 12 is even; *Q:* The number 12 is a composite number.

**CHECK IT OUT!** 1. The free chlorine level in a pool should be between 1.0 and 3.0 parts per million inclusive. Write a compound inequality to show the levels that are within this range. Graph the solutions.

In this diagram, oval $A$ represents some integer solutions of $x < 10$, and oval $B$ represents some integer solutions of $x > 0$. The overlapping region represents numbers that belong in both ovals. Those numbers are solutions of *both* $x < 10$ *and* $x > 0$.
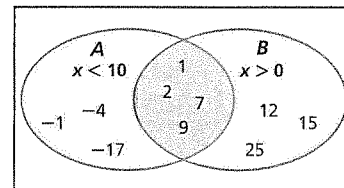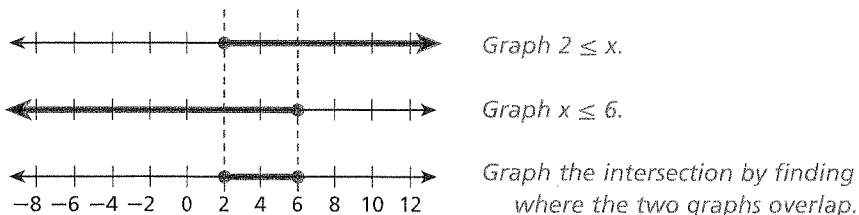


You can graph the solutions of a compound inequality involving AND by using the idea of an overlapping region. The overlapping region is called the **intersection** and shows the numbers that are solutions of both inequalities.
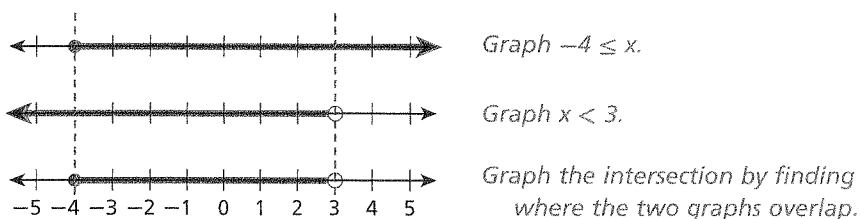


$x < 10$

$x > 0$

$0 < x < 10$
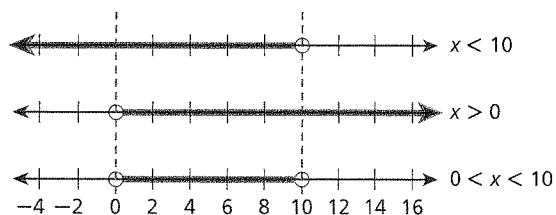
E X A M P L E **2** **Solving Compound Inequalities Involving AND**

Solve each compound inequality and graph the solutions.

**A** $4 \le x + 2 \le 8$

$4 \le x + 2$ AND $x + 2 \le 8$    *Write the compound inequality using AND.*

$\dfrac{-2 \quad -2}{2 \le x}$ AND $\dfrac{-2 \quad -2}{x \quad \le 6}$    *Solve each simple inequality.*



*Graph $2 \le x$.*

*Graph $x \le 6$.*

*Graph the intersection by finding where the two graphs overlap.*

**B** $-5 \le 2x + 3 < 9$

$-5 \le 2x + 3 < 9$    *Since 3 is added to 2x, subtract 3 from each part of the inequality.*

$\dfrac{-3 \quad -3 \quad -3}{-8 \le 2x \quad < 6}$

$\dfrac{-8}{2} \le \dfrac{2x}{2} < \dfrac{6}{2}$    *Since x is multiplied by 2, divide each part of the inequality by 2.*

$-4 \le x < 3$



*Graph $-4 \le x$.*

*Graph $x < 3$.*

*Graph the intersection by finding where the two graphs overlap.*

**Remember!**

The statement $-5 \le 2x + 3 \le 9$ consists of two inequalities connected by AND. Example 2B shows a "shorthand" method for solving this type of inequality.
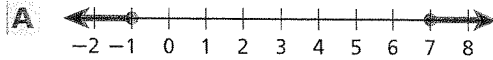
**CHECK IT OUT!** Solve each compound inequality and graph the solutions.

**2a.** $-9 < x - 10 < -5$         **2b.** $-4 \le 3n + 5 < 11$

EXAMPLE **4** **Writing a Compound Inequality from a Graph**

Write the compound inequality shown by each graph.

**A** 


-2 -1 0 1 2 3 4 5 6 7 8

*The shaded portion of the graph is not between two values, so the compound inequality involves OR.*

*On the left, the graph shows an arrow pointing left, so use either < or ≤.*
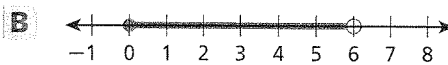*The solid circle at −1 means −1 is a solution, so use ≤.*

$x \le -1$

*On the right, the graph shows an arrow pointing right, so use either > or ≥.*
*The solid circle at 7 means 7 is a solution, so use ≥.*

$x \ge 7$

The compound inequality is $x \le -1$ OR $x \ge 7$.

**B**


-1 0 1 2 3 4 5 6 7 8

*The shaded portion of the graph is between the values 0 and 6, so the compound inequality involves AND.*

*The shaded values are to the right of 0, so use > or ≥.*
*The solid circle at 0 means 0 is a solution, so use ≥.*

$x \ge 0$

*The shaded values are to the left of 6, so use < or ≤.*
*The empty circle at 6 means 6 is not a solution, so use <.*

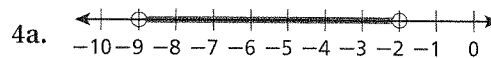$x < 6$

The compound inequality is $x \ge 0$ AND $x < 6$.

**Writing Math**

The compound inequality in Example 4B can also be written with the variable between the two endpoints.
$0 \le x < 6$

**CHECK IT OUT!** Write the compound inequality shown by the graph.

4a.

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0

4b.

-5 -4 -3 -2 -1 0 1 2 3 4 5

**THINK AND DISCUSS**

1. Describe how to write the compound inequality $y > 4$ AND $y \le 12$ without using the joining word AND.
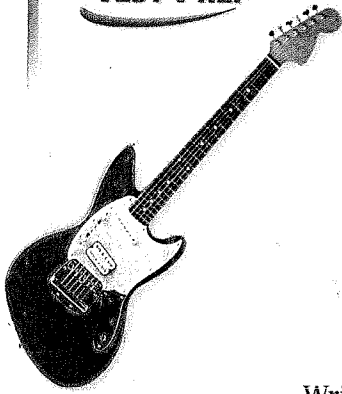
**Know it! Note**

2. **GET ORGANIZED** Copy and complete the graphic organizers. Write three solutions in each of the three sections of the diagram. Then write each of your nine solutions in the appropriate column or columns of the table.


A
$x > 5$
B
$x < 10$
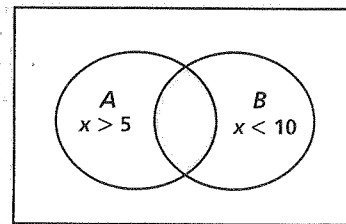
| $x > 5$ AND $x < 10$ | $x > 5$ OR $x < 10$ |
|---|---|
|  |  |

**29.** This problem will prepare you for the Multi-Step Test Prep on page 218.

Jenna's band is going to record a CD at a recording studio. They will pay $225 to use the studio for one day and $80 per hour for sound technicians. Jenna has $200 and can reasonably expect to raise up to an additional $350 by taking pre-orders for the CDs.

**a.** Explain how the inequality $200 \leq 225 + 80n \leq 550$ can be used to find the number of hours Jenna and her band can afford to use the studio and sound technicians.

**b.** Solve the inequality. Are there any numbers in the solution set that are not reasonable in this situation?

**c.** Suppose Jenna raises $350 in pre-orders. How much more money would she need to raise if she wanted to use the studio and sound technicians for 6 hours?

**Write and graph a compound inequality for the numbers described.**

**30.** all real numbers between −6 and 6

**31.** all real numbers less than or equal to 2 and greater than or equal to 1

**32.** all real numbers greater than 0 and less than 15

**33.** all real numbers between −10 and 10 inclusive
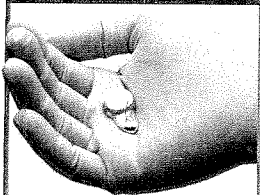
**34. Transportation** The cruise-control function on Georgina's car should keep the speed of the car within 3 mi/h of the set speed. Write a compound inequality to show the acceptable speeds $s$ if the set speed is 55 mi/h. Graph the solutions.

**35. Chemistry** Water is not a liquid if its temperature is above 100 °C or below 0 °C. Write a compound inequality for the temperatures $t$ when water is not a liquid.
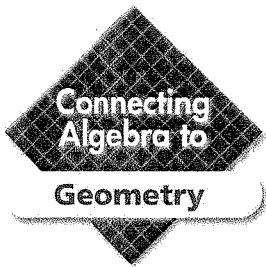
**Solve each compound inequality and graph the solutions.**

**36.** $5 \leq 4b - 3 \leq 9$

**37.** $-3 < x - 1 < 4$

**38.** $r + 2 < -2$ OR $r - 2 > 2$

**39.** $2a - 5 < -5$ OR $3a - 2 > 1$

**40.** $x - 4 \geq 5$ AND $x - 4 \leq 5$

**41.** $n - 4 < -2$ OR $n + 1 > 6$

**42. Sports** The ball used in a soccer game may not weigh more than 16 ounces or less than 14 ounces at the start of the match. After $1\frac{1}{2}$ ounces of air was added to a ball, the ball was approved for use in a game. Write and solve a compound inequality to show how much the ball might have weighed before the air was added.

**43. Meteorology** Tornado damage is rated using the Fujita scale shown in the table. A tornado has a wind speed of 200 miles per hour. Write and solve a compound inequality to show how many miles per hour the wind speed would need to increase for the tornado to be rated "devastating" but not "incredible."

| Fujita Tornado Scale | | |
|---|---|---|
| Category | Type | Wind Speed (mi/h) |
| F0 | Weak | 40 to 72 |
| F1 | Moderate | 73 to 112 |
| F2 | Significant | 113 to 157 |
| F3 | Severe | 158 to 206 |
| F4 | Devastating | 207 to 260 |
| F5 | Incredible | 261 to 318 |

**44.** Give a real-world situation that can be described by a compound inequality. Write the inequality that describes your situation.

**45. Write About It** How are the graphs of the compound inequality $x < 3$ AND $x < 7$ and the compound inequality $x < 3$ OR $x < 7$ different? How are the graphs alike? Explain.

**Chemistry**

The element gallium is in a solid state at room temperature but becomes a liquid at about 30 °C. Gallium stays in a liquid state until it reaches a temperature of about 2204 °C.
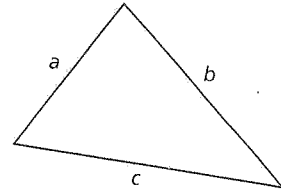
# Triangle Inequality

For any triangle, the sum of the lengths of any two sides is greater than the length of the third side.

The sides of this triangle are labeled $a$, $b$, and $c$. You can use the Triangle Inequality to write three statements about the triangle.

$$a + b > c \qquad a + c > b \qquad b + c > a$$

Unless all three of the inequalities are true, the lengths $a$, $b$, and $c$ cannot form a triangle.
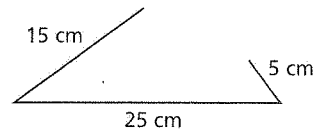


## Example 1

Can three side lengths of 25 cm, 15 cm, and 5 cm form a triangle?

**a.** $25 + 15 > 5$    **b.** $25 + 5 > 15$    **c.** $15 + 5 > 25$
$40 > 5$ _True_      $30 > 15$ _True_      $20 > 25$ _False_

One of the inequalities is false, so the three lengths will not make a triangle. The situation is shown in the figure to the right.



## Example 2

Two sides of a triangle measure 8 ft and 10 ft. What is the range of lengths of the third side?

Start by writing three statements about the triangle. Use $x$ for the unknown side length.

**a.** $8 + 10 > x$
$18 > x$

_The third side must be shorter than 18 ft._

**b.** $8 + x > 10$
$8 + x - 8 > 10 - 8$
$x > 2$

_The third side must be longer than 2 ft._

**c.** $x + 10 > 8$
$x + 10 - 10 > 8 - 10$
$x > -2$

_This provides no new useful information._

From part **a,** the third side must be shorter than 18 ft. And from part **b,** it must be longer than 2 ft. An inequality showing this is $2 < x < 18$.

## Try This

Decide whether the three lengths given can form a triangle. If not, explain.

**1.** 14 ft, 30 ft, 10 ft      **2.** 11 cm, 8 cm, 17 cm      **3.** $6\frac{1}{2}$ yd, 3 yd, $2\frac{3}{4}$ yd

Write a compound inequality for the range of lengths of the third side of each triangle.

**4.**

7 in.
7 in.

**5.**

8.2 ft
5.7 ft

**6.**

18 m
15 m
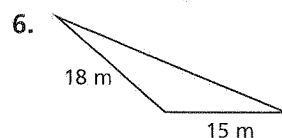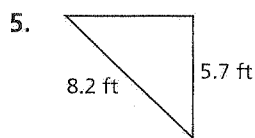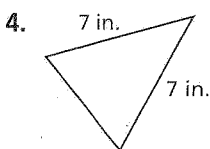
**CHECK IT OUT!** Solve each inequality and graph the solutions.

**1a.** $2|x| \leq 6$

**1b.** $|x + 3| - 4.5 \leq 7.5$

The inequality $|x| > 5$ describes all real numbers whose distance from 0 is greater than 5 units. The solutions are all numbers less than $-5$ or greater than 5. The inequality $|x| > 5$ can be rewritten as the compound inequality $x < -5$ OR $x > 5$.

**Know it! Note**

## Absolute-Value Inequalities Involving >

| WORDS | NUMBERS |
|---|---|
| The inequality $|x| > a$ (when $a > 0$) asks, "What values of $x$ have an absolute value greater than $a$?" The solutions are numbers less than $-a$ or greater than $a$. | $|x| > 5$ <br> $x < -5$ OR $x > 5$ |
| **GRAPH** | **ALGEBRA** |
| $\leftarrow$ a units $\rightarrow$$\leftarrow$ a units $\rightarrow$ <br> $-a$ 　 $0$ 　 $a$ | $|x| > a$ (when $a > 0$) <br> $x < -a$ OR $x > a$ |

The same properties are true for inequalities that use the symbol $\geq$.

**EXAMPLE 2** Solving Absolute-Value Inequalities Involving >

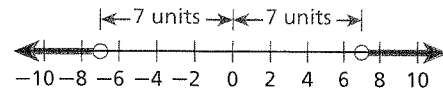Solve each inequality and graph the solutions.

**A** $|x| - 20 > -13$

$$|x| - 20 > -13$$
$$\underline{\phantom{|x|}+ 20 \quad + 20}$$
$$|x| \quad > \quad 7$$

*Since 20 is subtracted from $|x|$, add 20 to both sides to undo the subtraction.*

$$x < -7 \text{ OR } x > 7$$

*Write as a compound inequality.*

$\leftarrow$ 7 units $\rightarrow$$\leftarrow$ 7 units $\rightarrow$
$-10\,-8\,-6\,-4\,-2\;\;0\;\;2\;\;4\;\;6\;\;8\;\;10$

**B** $|x - 8| + 5 \geq 11$

$$|x - 8| + 5 \geq 11$$
$$\underline{\phantom{|x-8|}- 5 \quad - 5}$$
$$|x - 8| \quad \geq \quad 6$$

*Since 5 is added to $|x - 8|$, subtract 5 from both sides to undo the addition.*

$$x - 8 \leq -6 \text{ OR } x - 8 \geq 6$$

*Write as a compound inequality.*

$$\underline{+ 8 \quad + 8 \qquad + 8 \quad + 8}$$

*Solve each inequality.*

$$x \quad \leq 2 \text{ OR } x \quad \geq 14$$

*Write as a compound inequality.*

$-2\;\;0\;\;2\;\;4\;\;6\;\;8\;\;10\;\;12\;\;14\;\;16\;\;18$
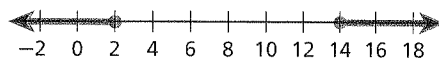
**CHECK IT OUT!** Solve each inequality and graph the solutions.

**2a.** $|x| + 10 \geq 12$

**2b.** $\left| x + 2\frac{1}{2} \right| + \frac{1}{2} \geq 4$

## THINK AND DISCUSS

**1.** Describe how the solutions of $7|x| \leq 21$ are different from the solutions of $7|x| < 21$.

**2. GET ORGANIZED** Copy and complete the graphic organizer. In each box, write an example of the indicated type of absolute-value inequality and then solve.
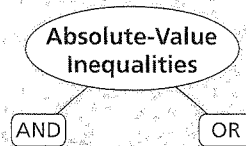
Absolute-Value Inequalities

AND          OR

---

# 3-7 Exercises

## GUIDED PRACTICE

Solve each inequality and graph the solutions.

SEE EXAMPLE **1**
p. 212

**1.** $|x| - 5 \leq -2$

**2.** $|x + 1| + 7.8 < 6.2$

**3.** $|3x| + 2 < 8$

**4.** $4|x| \leq 20$

**5.** $|x + 5| + 1 < 2$

**6.** $\left|x + \frac{1}{2}\right| + \frac{1}{2} \leq 3\frac{1}{2}$

SEE EXAMPLE **2**
p. 213

**7.** $|x| + 6 > 16$

**8.** $|x| + 2.9 > 8.6$

**9.** $2|x| \geq 8$

**10.** $|x + 2| > 7$

**11.** $|x + 3| + 2 \geq 4$

**12.** $|x + 5| + 4\frac{1}{2} \geq 7\frac{1}{2}$

SEE EXAMPLE **3**
p. 214

**13. Nutrition** A nutritionist recommends that an adult male consume 55 grams of fat per day. It is acceptable for the fat intake to differ from this amount by at most 25 grams. Write and solve an absolute-value inequality to find the range of fat intake that is acceptable. Graph the solutions.

SEE EXAMPLE **4**
p. 214

Solve each inequality.

**14.** $|x| + 8 \leq 2$

**15.** $|x + 3| < -5$

**16.** $|x + 4| \geq -8$

**17.** $|x - 5| + \frac{1}{3} > -1$

**18.** $|3x| + 7 > 2$

**19.** $|x - 7| + 3.5 \leq 2$

## PRACTICE AND PROBLEM SOLVING

Solve each inequality and graph the solutions.

**20.** $|x| + 6 \leq 10$

**21.** $|x - 3| < 1$

**22.** $|x - 2| - 8 \leq -3$

**23.** $|5x| < 15$

**24.** $|x - 2.4| + 4 \leq 6.4$

**25.** $4 + |x + 3| < 7$

**26.** $|x - 1| > 2$

**27.** $6|x| \geq 60$

**28.** $|x - 4| + 3 > 8$

**29.** $2|x + 2| \geq 16$

**30.** $3 + |x - 4| > 4$

**31.** $\left|x - \frac{1}{2}\right| + 9 > 10\frac{1}{2}$

**32.** The thermostat for a sauna is set to 175 °F, but the actual temperature of the sauna may vary by as much as 12 °F. Write and solve an absolute-value inequality to find the range of possible temperatures. Graph the solutions.

Solve each inequality.

**33.** $12 + |x| \leq 10$

**34.** $\left|x + \frac{3}{5}\right| - 2 > -4$

**35.** $|x + 1| + 5 \geq 4$

**36.** $|4x| - 3 < -6$

**37.** $3|x - 4| \leq -9$
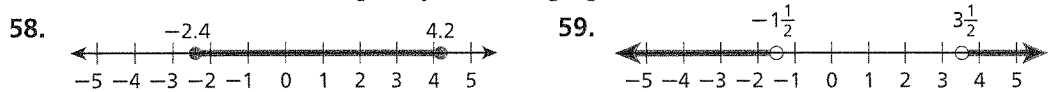
**38.** $|2x| + 9 \geq 9$

53. **Critical Thinking** For which values of $k$ does the inequality $|x| + 1 < k$ have no solutions? Explain.

54. **Write About It** Describe how to use an absolute-value inequality to find all the values on a number line that are within 5 units of $-6$.

55. What is the solution of the inequality $3 + |x + 4| < 6$?

   (A) $-13 < x < 5$          (C) $-6 < x < -2$

   (B) $-7 < x < -1$         (D) $1 < x < 7$

56. A thermometer gives temperature readings that may be inaccurate by at most 2 °F. The actual temperature is 75 °F. Which absolute-value inequality describes the range of temperatures that may be shown on the thermometer?

   (F) $|x - 75| \le 2$    (G) $|x + 75| \le 2$    (H) $|x - 75| \ge 2$    (J) $|x + 75| \ge 2$

57. The inequality $|w - 156| \le 3$ describes the weights of members of a wrestling team. Which statement is NOT true?

   (A) All of the team members weigh no more than 159 pounds.

   (B) A team member may weigh 152 pounds.

   (C) Every member of the team is at most 3 pounds away from 156 pounds.

   (D) There are no team members who weigh 160 pounds.

## CHALLENGE AND EXTEND

Write an absolute-value inequality for each graph.

58.
```
        -2.4                  4.2
  ←+——+——●——+——+——+——+——+——●——+→
  -5 -4 -3 -2 -1  0  1  2  3  4  5
```

59.
```
              -1½              3½
  ←+——+——+——○——+——+——+——+——○——+→
  -5 -4 -3 -2 -1  0  1  2  3  4  5
```

60. **Critical Thinking** Fill in the missing reasons to justify each step in solving $|2x - 6| + 5 \le 7$.

| Statements | Reasons |
|---|---|
| 1.      $\|2x - 6\| + 5 \le 7$ | Given |
| 2.       $\|2x - 6\| \le 2$ | ? |
| 3. $2x - 6 \ge -2$ AND $2x - 6 \le 2$ | Definition of absolute value |
| 4.    $2x \ge 4$    AND    $2x \le 8$ | ? |
| 5.     $x \ge 2$    AND    $x \le 4$ | ? |

## SPIRAL REVIEW

Solve each proportion. Check your answer. *(Lesson 2-7)*

61. $\dfrac{x + 1}{4} = \dfrac{5}{8}$      62. $\dfrac{2}{15} = \dfrac{6}{y - 5}$      63. $\dfrac{12}{m + 2} = \dfrac{8}{3}$      64. $\dfrac{7 + g}{10} = \dfrac{6}{8}$

Describe the solutions of each inequality in words. *(Lesson 3-1)*

65. $16 > 8m$      66. $c + 4 < 11$      67. $-4 \le x + 2$      68. $0 \ge x + 7$

Solve each compound inequality and graph the solutions. *(Lesson 3-6)*

69. $-3 < x - 3 < 1$                70. $-3 \le 2x + 1 \le 9$

71. $x - 2 < -1$ OR $x - 2 > 2$       72. $x + 4 \le 3$ OR $x + 4 \ge 6$

# READY TO GO ON?

## Quiz for Lessons 3-4 Through 3-7

### 3-4 Solving Two-Step and Multi-Step Inequalities

Solve each inequality and graph the solutions.

**1.** $2x + 3 < 9$       **2.** $3t - 2 > 10$       **3.** $7 \geq 1 - 6r$

Solve each inequality.

**4.** $2(x - 3) > -1$       **5.** $\frac{1}{3}a + \frac{1}{2} > \frac{2}{3}$

**6.** $15 < 5(m - 7)$       **7.** $2 + (-6) > 0.8p$

**8.** The average of Mindy's two test scores must be at least 92 to make an A in the class. Mindy got an 88 on her first test. What scores can she get on her second test to make an A in the class?

### 3-5 Solving Inequalities with Variables on Both Sides

Solve each inequality and graph the solutions.

**9.** $5x < 3x + 8$       **10.** $6p - 3 > 9p$       **11.** $r - 8 \geq 3r - 12$

Solve each inequality.

**12.** $3(y + 6) > 2(y + 4)$       **13.** $4(5 - g) \geq g$

**14.** $4x < 4(x - 1)$       **15.** $3(1 - x) \geq -3(x + 2)$

**16.** Phillip has $100 in the bank and deposits $18 per month. Gil has $145 in the bank and deposits $15 per month. For how many months will Gil have a larger bank balance than Phillip?

### 3-6 Solving Compound Inequalities

Solve each compound inequality and graph the solutions.

**17.** $-2 \leq x + 3 < 9$       **18.** $m + 2 < -1 \text{ OR } m - 2 > 6$

**19.** $-3 \geq x - 1 > 2$       **20.** $-2 > r + 2 \text{ OR } r + 4 < 5$

**21.** It is recommended that a certain medicine be stored in temperatures above 32 °F and below 70 °F. Write a compound inequality to show the acceptable storage temperatures for this medicine.

### 3-7 Solving Absolute-Value Inequalities

Solve each inequality and graph the solutions.

**22.** $|x| + 9 \leq 12$       **23.** $|x + 7| - 15 < 6$       **24.** $4.5|x| \geq 31.5$

Solve each inequality.

**25.** $|x - 2| \leq 14$       **26.** $|x| - 9.2 < -5.7$

**27.** $\frac{1}{2} + 2|x| > -4$       **28.** $7 + |3x| > 13$

**29.** Eli attended a concert. The decibel level of the music averaged 110 decibels but varied by 22 decibels from the average. Write and solve an absolute-value inequality to find the decibel range. Graph the solutions.

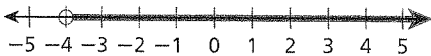## 3-2 Solving Inequalities by Adding or Subtracting *(pp. 176–181)*

### EXAMPLES

Solve each inequality and graph the solutions.

■ $x + 6 > 2$

$$\begin{array}{ll} x + 6 > \phantom{-}2 & \textit{Since 6 is added to x,} \\ \underline{-6 \quad -6} & \quad \textit{subtract 6 from both sides.} \\ x \phantom{+6} > -4 \end{array}$$


$$-5\ -4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4\ \ 5$$

■ $n - 1.3 < 3.2$

$$\begin{array}{ll} n - 1.3 < \phantom{-}3.2 & \textit{Since 1.3 is subtracted from x,} \\ \underline{+1.3 \quad +1.3} & \quad \textit{add 1.3 to both sides.} \\ n \phantom{+1.3} < \phantom{-}4.5 \end{array}$$


$$0\ \ 0.5\ \ 1\ \ 1.5\ \ 2\ \ 2.5\ \ 3\ \ 3.5\ \ 4\ \ 4.5\ \ 5$$
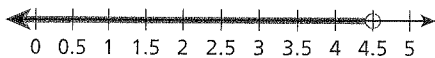
### EXERCISES

Solve each inequality and graph the solutions.

**18.** $t + 3 < 10$      **19.** $k - 7 \le -5$

**20.** $-1 < m + 4$      **21.** $x + 2.3 \ge 6.8$

**22.** $w - 3 < 6.5$      **23.** $4 > a - 1$

**24.** $h - \dfrac{1}{4} < \dfrac{3}{4}$      **25.** $5 > 7 + v$

**26.** Tammy wants to run at least 10 miles per week. So far this week, she ran 4.5 miles. Write and solve an inequality to determine how many more miles Tammy must run this week to reach her goal.

**27.** Rob has a gift card for $50. So far, he has selected a shirt that costs $32. Write and solve an inequality to determine the additional amount Rob could spend without exceeding the gift card limit.
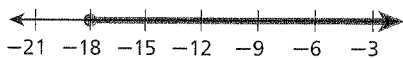
## 3-3 Solving Inequalities by Multiplying or Dividing *(pp. 182–187)*

### EXAMPLES

■ Solve $\dfrac{p}{-3} \le 6$ and graph the solutions.

$$\begin{array}{ll} \dfrac{p}{-3} \le 6 & \textit{Since p is divided by −3,} \\ & \quad \textit{multiply both sides by −3.} \\ -3 \cdot \dfrac{p}{-3} \ge -3 \cdot 6 \\ p \ge -18 & \textit{Change } \le \textit{ to } \ge. \end{array}$$


$$-21\ \ -18\ \ -15\ \ -12\ \ -9\ \ -6\ \ -3$$

■ Pizzas cost $5.50 each. What are the possible numbers of pizzas that can be purchased with $30?

Let $n$ represent the number of pizzas that can be purchased.

| $5.50 | times | number of pizzas | is at most | $30. |
|--------|-------|------------------|------------|------|
| 5.50 | • | $n$ | ≤ | 30 |

$$5.50n \le 30$$

$$\dfrac{5.50n}{5.50} \le \dfrac{30}{5.50} \qquad \textit{Since n is multiplied by 5.50,}$$
$$\qquad\qquad\qquad\qquad \textit{divide both sides by 5.50.}$$

$$n \le 5\dfrac{5}{11}$$

Only a whole number of pizzas can be purchased, so 0, 1, 2, 3, 4, or 5 pizzas can be purchased.

### EXERCISES

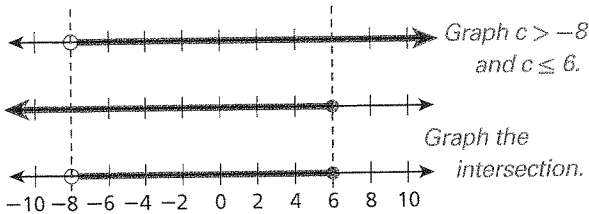Solve each inequality and graph the solutions.

**28.** $3a \le 15$

**29.** $-18 < 6t$

**30.** $\dfrac{p}{4} > 2$

**31.** $\dfrac{2}{5}x \le -10$

**32.** $-3n < -18$

**33.** $\dfrac{g}{-2} > 6$

**34.** $-2k < 14$

**35.** $-3 > \dfrac{1}{3}r$

**36.** $27 < -9h$

**37.** $-0.4g > -1$

**38.** Notebooks cost $1.39 each. What are the possible numbers of notebooks that can be purchased with $10?

**39.** A senior class is selling lanyards as a fundraiser. The profit for each lanyard is $0.75. Write and solve an inequality to determine the number of lanyards the class must sell to make a profit of at least $250.

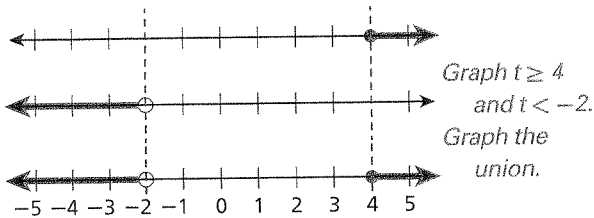## 3-6 Solving Compound Inequalities (pp. 204–210)

### EXAMPLES

Solve each compound inequality and graph the solutions.

■ $-3 < c + 5 \le 11$    *Since 5 is added to c, subtract*
$$\frac{-5 \quad -5 \quad -5}{-8 < c \quad \le 6}$$ *5 from each part of the inequality.*

*Graph c > −8 and c ≤ 6.*

*Graph the intersection.*

■ $-2 + t \ge 2 \text{ OR } t + 3 < 1$
$$\frac{+2 \quad +2 \qquad -3 \quad -3}{t \ge 4 \text{ OR } \quad t < -2}$$ *Solve the simple inequalities.*

*Graph t ≥ 4 and t < −2.*

*Graph the union.*

### EXERCISES

Solve each compound inequality and graph the solutions.

**63.** $-4 < t + 6 < 10$    **64.** $-8 < k - 2 \le 5$

**65.** $-8 + r > 4 \text{ OR } r + 1 < -1$

**66.** $2 > n + 3 > 5$

**67.** $12 \ge p + 7 > 5$

**68.** $3 < s + 9 \text{ OR } 1 > s - 4$

**69.** One day, the high temperature was 84 °F and the low temperature was 68 °F. Write a compound inequality to represent the day's temperatures.

**70.** The table shows formulas for the recommended heart rates during exercise for a person who is $a$ years old. Write and solve a compound inequality to determine the heart rate range for a 16-year-old person.

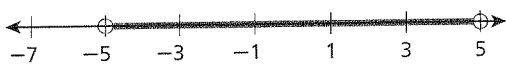| Recommended Heart Rate Range | |
|---|---|
| Lower Limit | $0.5 \times (220 - a)$ |
| Upper Limit | $0.9 \times (220 - a)$ |

## 3-7 Solving Absolute-Value Inequalities (pp. 212–217)

### EXAMPLES

Solve each inequality and graph the solutions.

■ $|x| + 4 < 9$
$|x| + 4 < 9$
$$\frac{-4 \quad -4}{|x| \quad < 5}$$ *Subtract 4 from both sides.*

$x > -5 \text{ AND } x < 5$   *Write as a compound inequality.*

■ $|x - 3| + 7 \ge 13$
$$\frac{-7 \quad -7}{|x - 3| \quad \ge 6}$$ *Subtract 7 from both sides.*
$x - 3 \le -6 \text{ OR } x - 3 \ge 6$   *Solve the two inequalities.*
$$\frac{+3 \quad +3 \qquad +3 \quad +3}{x \le -3 \text{ OR } x \ge 9}$$
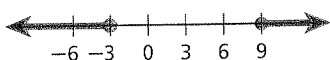
### EXERCISES

Solve each inequality and graph the solutions.

**71.** $|x| - 7 \le 15$    **72.** $|x + 4| > 8$

**73.** $6|x| \le 24$    **74.** $|x + 9| + 11 < 20$

**75.** $3|x| \ge 9$    **76.** $4|2x| < 24$

Solve the inequality.

**77.** $|x| - 5.4 > 8.5$    **78.** $|5.2 + x| < 7.3$
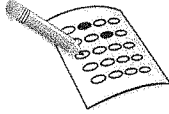
**79.** $|x - 7| + 10 \ge 12$    **80.** $14|x| - 15 \ge 41$

**81.** $\left|x - \dfrac{1}{2}\right| + 4 \le \dfrac{5}{2}$    **82.** $|x + 5.5| - 6.4 \le 4.9$

**83.** The water depth for a pool is set to 6 ft, but the actual depth of the pool may vary by as much as 4 in. Write and solve an absolute-value inequality to find the range of possible water depths in inches. Graph the solutions.

# COLLEGE ENTRANCE EXAM PRACTICE

## FOCUS ON SAT STUDENT-PRODUCED RESPONSES

Ten questions on the SAT require you to enter your answer in a special grid like the one shown. You do not have to write your answer in the boxes at the top of the grid, but doing this may help you avoid errors when filling in the grid. The circles must be filled in correctly for you to receive credit.

**HOT TIP!**

You cannot enter a zero in the first column of the grid. This is to encourage you to give a more accurate answer when you need to round. For example, $\frac{1}{16}$ written as a decimal is 0.0625. This should be entered in the grid as .063 instead of 0.06.

You may want to time yourself as you take this practice test. It should take you about 9 minutes to complete.

---

1. Mailing a standard-sized letter in 2005 by first-class mail cost $0.37 for a letter weighing 1 ounce or less and $0.23 for each additional ounce. How much did it cost, in dollars, to send a standard-sized letter that weighed 3 ounces?

2. If $p = q - 2$ and $\frac{q}{3} = 9$, what is the value of $p$?

3. Give the maximum value of $x$ if $12 - 3(x + 1) \geq \frac{1}{2}(3 - 5)$.

4. Give the minimum value of $x$ if $2x + y \leq 7x - 9$ and $y = -3$.

5. For what integer value of $x$ is $2x - 9 < 5$ and $x - 1 > 4$?

6. What is the minimum value of $z$ that satisfies the inequality $z - 7.3 \geq 4.1$?

7. To be eligible for financial aid, Alisa must work at least 15 hours per week in a work-study program. She wants to spend at least 5 more hours studying than working each week. What is the minimum number of hours per day (Monday through Friday) that she must study to meet this goal and be eligible for financial aid?

8. For all real numbers $a$ and $b$, define the operation # as follows:
$$a \# b = 2a - b$$
Given $a = 3$ and $a \# b = 1$, what is the value of $b$?

Read each sample and answer the questions that follow by using the scoring rubric below.

### Scoring Rubric:

**2 points:** The student demonstrates a thorough understanding of the concept, correctly answers the question, and provides a complete explanation.

**1 point:** The student correctly answers the question but does not show all work or does not provide an explanation.

**1 point:** The student makes minor errors resulting in an incorrect solution but shows and explains understanding of the concept.

**0 points:** The student gives a response but shows no work or explanation, or the student gives no response.

### Sample A
**Short Response** Write a real-world situation that can be modeled by the inequality $25s - 75 \geq 250$. Solve for $s$ and explain how the value of $s$ relates to your situation.

**Student's Answer**

*A painter rents a booth at the county fair for $75. The artist sells his paintings for $25 each. If he makes at least $250 in profit, he can buy a new easel.*

*The artist has to sell at least 13 paintings.*

1. What score should the student's answer receive? Explain your reasoning.

2. What additional information, if any, should the student's answer include in order to receive full credit?
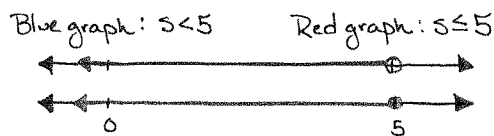
### Sample B
**Short Response** How do the solutions of $3s - 10 < 15 - 2s$ and $-34 + 9s \leq 4s - 9$ differ? How are the solutions alike? Include a graph in your explanation.

**Student's Answer**

Solve both inequalities.

$$
\begin{array}{ll}
3s - 10 < 15 - 2s & -34 + 9s \leq 4s - 9 \\
\underline{+2s \qquad\quad +2s} & \underline{\quad -4s \quad -4s} \\
5s - 10 < 15 & -34 + 5s \leq -9 \\
\underline{+10 \quad +10} & \underline{+34 \qquad\quad +34} \\
5s < 25 & 5s \leq 25 \\
\dfrac{5s}{5} < \dfrac{25}{5} & \dfrac{5s}{5} \leq \dfrac{25}{5} \\
s < 5 & s \leq 5
\end{array}
$$

Blue graph: $s < 5$     Red graph: $s \leq 5$



3. What score should the student's answer receive? Explain your reasoning.

4. What additional information, if any, should the student's answer include in order to receive full credit?

### Sample C
**Short Response** Explain the difference between the solution of the equation $x - 6 = 2x + 9$ and the solutions of the inequality $x - 6 < 2x + 9$.

**Student's Answer**

*The equation has a solution of $x = -15$, and the inequality has a solution of $x > -15$. The equation is true only when $x$ equals $-15$. The inequality is true for all values greater than $-15$.*

5. What score should the student's answer receive? Explain your reasoning.

6. What additional information, if any, should the student's answer include in order to receive full credit?

**10.** Which inequality has the same solutions as $p < -2$?

- (F) $p + 1 < -2$
- (G) $p + 4 < 2$
- (H) $2p + 1 < -4$
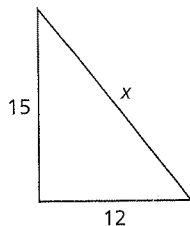- (J) $3p < -12$

**11.** What is the greatest integer solution of $5 - 3m > 11$?

- (A) 0
- (B) $-1$
- (C) $-2$
- (D) $-3$

## Gridded Response

**12.** The sum of the measures of any two sides of a triangle must be greater than the measure of the third side. What is the greatest possible integer value for $x$?



**13.** After 2 years, the simple interest paid on an investment of $2500 was $175. What percent was the interest rate?

**14.** Amy's bowling score in her third game was 10 points less than her score in the first game and 5 points more than her score in the second game. The total points for all three games was no more than 275. What is the greatest number of points Amy could have scored in her first game?

**15.** Trevor needs a 93 on his second quiz to have a quiz average of 90. What score did Trevor receive on his first quiz?

**16.** The radius of a circle can be determined by the formula $r = \sqrt{\frac{A}{\pi}}$. What is the length in meters of the radius of a circle that has an area of 314 square meters? (Use 3.14 for $\pi$.)

## Short Response

**17.** Write 2 different inequalities that have the same solution as $n > 3$ such that

a. the first inequality uses the symbol $>$ and requires addition or subtraction to solve.

b. the second inequality uses the symbol $<$ and requires multiplication or division to solve.

**18.** Alison has twice as many video games as Kyle. Maurice has 5 more video games than Alison. The total number of video games is less than 40.

a. Write an inequality to represent this situation.

b. Solve the inequality to determine the greatest number of video games Maurice could have. Justify each step in your solution.

**19.** Donna's Deli delivers lunches for $7 per person plus a $35 delivery fee. Larry's Lunches delivers lunches for $11 per person.

a. Write an expression to represent the cost of $x$ lunches from Donna's Deli. Write an expression to represent the cost of ordering $x$ lunches from Larry's Lunches.

b. Write an inequality to determine the number of lunches for which the cost of Larry's Lunches is less than the cost of Donna's Deli.

c. Solve the inequality and explain what the answer means. Which restaurant charges less for an order of 10 lunches?

## Extended Response

**20.** Aleya has two employment opportunities. Company A offered her a yearly salary of $31,000. Company B offered her a similar position with a yearly salary of $27,000 plus 2.5% commission on her total sales for the year.

a. Let $x$ represent Aleya's total sales for the year at company B. Write an expression to represent the total income after one year at company B.

b. Use your expression from part a to write an inequality that could be solved to determine the amount of sales for which the yearly income at company A would be greater than that at company B.

c. Solve the inequality from part b and explain the meaning of the solution in relation to Aleya's decision to work for company A or company B.

d. How much more than the salary at company A would Aleya make after one year at company B if her total sales for the year were $200,000?

# ARE YOU READY?

## ✓ Vocabulary

Match each term on the left with a definition on the right.

1. absolute value
2. algebraic expression
3. input
4. output
5. $x$-axis

A. a letter used to represent a value that can change

B. the value generated for $y$

C. a group of numbers, symbols, and variables with one or more operations

D. the distance of a number from zero on the number line

E. the horizontal number line in the coordinate plane

F. a value substituted for $x$

## ✓ Ordered Pairs

Graph each point on the same coordinate plane.

6. $(-2, 4)$
7. $(0, -5)$
8. $(1, -3)$
9. $(4, 2)$
10. $(3, -2)$
11. $(-1, -2)$
12. $(-1, 3)$
13. $(-4, 0)$

## ✓ Function Tables

Generate ordered pairs for each function for $x = -2, -1, 0, 1, 2$.

14. $y = -2x - 1$
15. $y = x + 1$
16. $y = -x^2$
17. $y = \frac{1}{2}x + 2$
18. $y = (x + 1)^2$
19. $y = (x - 1)^2$

## ✓ Solve Multi-Step Equations

Solve each equation. Check your answer.

20. $17x - 15 = 12$
21. $-7 + 2t = 7$
22. $-6 = \frac{p}{3} + 9$
23. $5n - 10 = 35$
24. $3r - 14 = 7$
25. $9 = \frac{x}{2} + 1$
26. $-2.4 + 1.6g = 5.6$
27. $34 - 2x = 12$
28. $2(x + 5) = -8$

## ✓ Solve for a Variable

Solve each equation for the indicated variable.

29. $A = \ell w$ for $w$
30. $V = \ell wh$ for $w$
31. $A = bh$ for $h$
32. $C = 2\pi r$ for $r$
33. $I = Prt$ for $P$
34. $V = \frac{1}{3}\ell wh$ for $h$