

## WHAT did you learn?

Write, solve, and graph an inequality in one variable.

- Simple linear inequalities (6.1)
- Multi-step linear inequalities (6.2)
- Compound inequalities (6.3)
- Absolute-value inequalities (6.4)

## WHY did you learn it?

- ➔ Summarize the melting points of metallic elements. (p. 338)
- ➔ Model and predict city population growth. (p. 341)
- ➔ Describe distances between planets. (p. 350)
- ➔ Determine wavelengths of colors of fireworks. (p. 357)

Write, solve, and graph a linear inequality in two variables. (6.5)

- ➔ Find different amounts of coins collected on a treasure-diving ship. (p. 362)

Use an inequality to model a real-life situation. (6.1–6.5)

- ➔ Analyze real-life situations. (p. 342)

Make a stem-and-leaf plot for data. (6.6)

- ➔ Display and order population data. (p. 368)

Use measures of central tendency to represent data. (6.6)

- ➔ Describe the average age of a high school graduate. (p. 370)

Draw a box-and-whisker plot of data. (6.7)

- ➔ Organize and compare backpack prices. (p. 376)

## How does Chapter 6 fit into the BIGGER PICTURE of algebra?

You studied solving and graphing linear inequalities in one and two variables and absolute-value inequalities. Many real-life situations can be described with phrases like “at most” or “less than,” which can be modeled using inequalities.

You also organized data using stem-and-leaf plots, measures of central tendency, and box-and-whisker plots. When reviewing this chapter, look for connections between solving and graphing equations and solving and graphing inequalities.

### STUDY STRATEGY

#### How did showing all your work help you make corrections?

When you show all your work, using the **Study Strategy** on p. 332, the solution steps may be like these.

*Showing My Work*

$$\begin{aligned}
 -3y + 9 &> 16 \\
 -3y + 9 - 9 &> 16 - 9 \\
 -3y &> 7 \\
 \frac{-3y}{-3} &> \frac{7}{-3} &< \text{I divided by a negative} \\
 y &> -\frac{7}{3} &< \text{number. I should have} \\
 &&< \text{reversed the inequality} \\
 &&< \text{symbol!} \\
 y &< -\frac{7}{3}
 \end{aligned}$$

## VOCABULARY

- graph of a linear inequality in one variable, p. 334
- equivalent inequalities, p. 335
- compound inequality, p. 346
- linear inequality in  $x$  and  $y$ , p. 360
- solution of a linear inequality, p. 360
- graph of a linear inequality in two variables, p. 360
- half-plane, p. 360
- stem-and-leaf plot, p. 368
- measure of central tendency, p. 369
- mean, or average, p. 369
- median, p. 369
- mode, p. 369
- box-and-whisker plot, p. 375
- quartiles, p. 375

## 6.1

### SOLVING ONE-STEP LINEAR INEQUALITIES

Examples on pp. 334–336

**EXAMPLE** Solve  $-0.9x \geq 3.6$ . Graph the solution.

$$-0.9x \geq 3.6$$

Write original inequality.

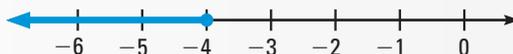
$$\frac{-0.9x}{-0.9} \leq \frac{3.6}{-0.9}$$

Divide each side by  $-0.9$  and reverse the inequality symbol.

$$x \leq -4$$

Simplify.

- ▶ The solution is all real numbers less than or equal to  $-4$ .



Solve the inequality and graph its solution.

1.  $x - 5 \leq -3$

2.  $\frac{3}{4} + x > 1$

3.  $\frac{x}{3} < -5$

4.  $-6x \geq -30$

## 6.2

### SOLVING MULTI-STEP LINEAR INEQUALITIES

Examples on pp. 340–342

**EXAMPLE** Solve  $7 + 2x < -3$ .

$$7 + 2x < -3$$

Write original inequality.

$$7 - 7 + 2x < -3 - 7$$

Subtract 7 from each side.

$$2x < -10$$

Simplify.

$$\frac{2x}{2} < \frac{-10}{2}$$

Divide each side by 2.

$$x < -5$$

Simplify.

- ▶ The solution is all real numbers less than  $-5$ .

Solve the inequality.

5.  $6x + 8 > 4$

6.  $10 - 3x < 5$

7.  $9 - 4x \geq -11$

8.  $5 - \frac{1}{2}x \leq -3$

## 6.3

## SOLVING COMPOUND INEQUALITIES

Examples on  
pp. 346–348**EXAMPLE** Solve  $1 < -2x + 3 < 9$ .

$$1 < -2x + 3 < 9 \quad \text{Write original inequality.}$$

$$-2 < -2x < 6 \quad \text{Subtract 3 from each expression.}$$

$$1 > x > -3 \quad \text{Divide each expression by } -2. \text{ Reverse both inequality symbols.}$$

▶ The solution is all real numbers greater than  $-3$  and less than  $1$ .

Solve the inequality. Write a sentence that describes the solution.

9.  $3 < x + 1 < 6$

10.  $6 \leq 2x + 3 \leq 10$

11.  $x + \frac{1}{2} \leq -\frac{3}{4}$  or  $\frac{1}{4}x - 1 > \frac{3}{4}$

## 6.4

## SOLVING ABSOLUTE-VALUE EQUATIONS AND INEQUALITIES

Examples on  
pp. 353–355**EXAMPLE** To solve both absolute-value equations and inequalities, remember that expressions inside absolute-value symbols can be either positive or negative.Solve  $|x - 4| > 3$ . $x - 4$  is positive.       $x - 4$  is negative.

$$x - 4 > 3 \quad x - 4 < -3$$

$$x > 7 \quad x < 1$$

▶ The solution is all real numbers greater than  $7$  or less than  $1$ , or  $x < 1$  or  $x > 7$ .

Solve the equation or the inequality.

12.  $|x| = 12$

13.  $|x - 5| = 11$

14.  $|x + 0.5| = 0.25$

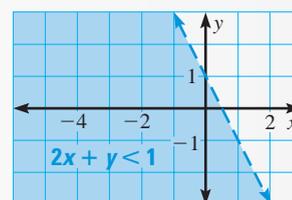
15.  $|5 + x| \leq 6$

16.  $|7 - x| > 2$

17.  $|3x + 2| - 4 \leq 8$

## 6.5

## GRAPHING LINEAR INEQUALITIES IN TWO VARIABLES

Examples on  
pp. 360–362**EXAMPLE** To graph  $2x + y < 1$ , first sketch the graph of the corresponding equation  $2x + y = 1$ . Use a dashed line because the inequality symbol is  $<$ . Next, test a point. The origin  $(0, 0)$  is a solution, so the graph of  $2x + y < 1$  includes  $(0, 0)$  and all points below the line.

Graph the inequality.

18.  $x < 2$

19.  $-2x + y > 4$

20.  $\frac{1}{3}x - 3y \leq 3$

21.  $2y - 6x \geq -2$

## STEM-AND-LEAF PLOTS AND MEAN, MEDIAN, AND MODE

Examples on  
pp. 368–370

**EXAMPLE** To make a stem-and-leaf plot for the following data, use the digits in the tens' place for the stem and the digits in the ones' place for the leaves.

40, 60, 34	<b>Stems</b>	3	4	<b>Leaves</b>	<b>Key: 6   0 = 60</b>
43, 68, 45		4	0 3 5		
61, 64, 54		5	1 2 4		
51, 64, 52		6	0 1 4 4 8		

The mean of the data is the sum of the numbers divided by 12, which is 53.

The median of the data is the average of the two middle numbers, which is 53.

The mode of the data is the number that occurs most often, which is 64.

22. The data below show the monthly water temperature (in degrees Fahrenheit) of the Gulf of Mexico near Pensacola, Florida. Make a stem-and-leaf plot of the data: 56, 58, 63, 71, 78, 84, 85, 86, 82, 78, 65, 58.
23. Find the mean, the median, and the mode of the data in Exercise 22.

## BOX-AND-WHISKER PLOTS

Examples on  
pp. 375–377

**EXAMPLE** The data show the average temperature (in degrees Celsius) for each month in Tokyo: 5.2, 5.6, 8.5, 14.1, 18.6, 21.7, 25.2, 27.1, 23.2, 17.6, 12.6, 7.9.

Write the numbers in order and find the quartiles of the data.

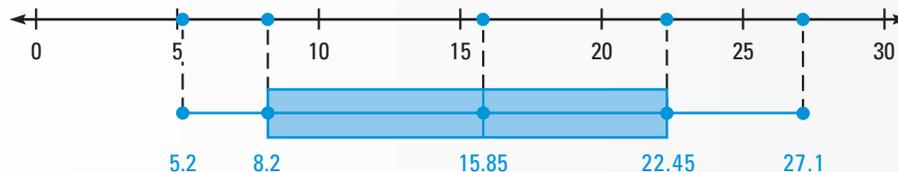
5.2 5.6 7.9 8.5 12.6 14.1 17.6 18.6 21.7 23.2 25.2 27.1

$$\text{Second quartile} = \frac{14.1 + 17.6}{2} = 15.85$$

$$\text{First quartile} = \frac{7.9 + 8.5}{2} = 8.2$$

$$\text{Third quartile} = \frac{21.7 + 23.2}{2} = 22.45$$

To make a box-and-whisker plot, draw a box that extends from the first to the third quartiles. Connect the least and greatest numbers to the box as the “whiskers.”



24. The data below show the average temperature (in degrees Celsius) for each month in Paris. Make a box-and-whisker plot of the data.
- 3.5, 4.2, 6.6, 9.5, 13.2, 16.3, 15.9, 16.0, 14.7, 12.2, 8.9, 7.3
25. Compare the box-and-whisker plot in Exercise 24 to the one in the Example. How do the data sets differ?

**Solve the inequality. Graph the solution on a number line.**

1.  $x - 3 < 10$

2.  $-6 > x + 5$

3.  $-32x > 64$

4.  $\frac{x}{4} \leq 8$

5.  $\frac{2}{3}x + 2 \leq 4$

6.  $6 - x > 15$

7.  $3x + 5 \leq 2x - 1$

8.  $(x + 6) \geq 2(1 - x)$

9.  $-2x + 8 > 3x + 10$

**Solve the inequality. Write a sentence that describes the solution.**

10.  $-15 \leq 5x < 20$

11.  $-3 \leq 4x + 5 \leq 7$

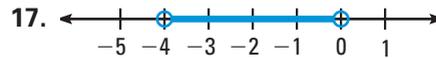
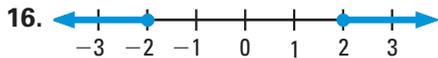
12.  $8x - 11 < 5$  or  $4x - 7 > 13$

13.  $-2x > 8$  or  $3x + 1 \geq 7$

14.  $12 > 4 - x > -5$

15.  $6x + 9 \geq 21$  or  $9x - 5 \leq 4$

**Write a compound inequality that describes the graph.**



**Solve the equation or the inequality.**

18.  $|x + 7| = 11$

19.  $|x - 8| - 3 \leq 10$

20.  $|x + 4.2| + 3.6 = 16.2$

21.  $|2x - 6| > 14$

22.  $|4x + 5| - 6 \leq 1$

23.  $|3x - 9| + 6 = 18$

**Sketch the graph of the inequality.**

24.  $x > -1$

25.  $x - 1 \leq -3$

26.  $-4x \leq 8$

27.  $x + 2y > 6$

28.  $3x + 4y \geq 12$

29.  $7y - 2x + 3 < 17$

 **EXERCISE BICYCLE PRICES** In Exercises 30–33, use these prices:  
\$1130, \$695, \$900, \$220, \$350, \$500, \$630, \$180, \$170, \$145, \$185, \$140.

30. Make a stem-and-leaf plot for the data. List the data in increasing order.

31. Find the mean, the median, and the mode of the data.

32. Find the first, second, and third quartiles. Which quartile is the median?

33. Draw a box-and-whisker plot of the data.

34.  **PAPER MAKING** One kind of machine makes paper in a roll that can be as wide as 33 feet or as narrow as 12 feet. Write a compound inequality for the possible widths of a roll of paper that this machine can produce.

35.  **WALKING DISTANCE** Walking at a rate of 210 feet per minute, you take 12 minutes to walk from your home to school. Your uncle's home is closer to school than your home is. Write an inequality for the distance  $d$  (in feet) that your uncle lives from your school.

36.  **RAFTING** Members of an outdoor club rent several rafts and launch all of the rafts at the same time. The first raft finishes in 36 minutes. The last raft finishes in 48 minutes. Write an absolute-value inequality that describes the finishing times.