CHAPTER 1

Chapter Summary

WHAT did you learn?

WHY did you learn it?

WHAT did you learn?	WHY did you learn it?
Graph and order real numbers. (1.1)	Analyze record low temperatures. (p. 8)
Identify properties of and perform operations with real numbers. (1.1)	Learn how to exchange money. (p. 6)
Evaluate and simplify algebraic expressions. (1.2)	Find the population of Hawaii. (p. 16)
Solve equations.	
• linear equations (1.3)	Find the temperature in degrees Celsius at which dry ice changes from a solid to a gas. (p. 23)
• absolute value equations (1.7)	Solve problems that involve tolerance. (p. 52)
Rewrite equations and common formulas with more than one variable. (1.4)	Find how much you should charge for tickets to a benefit concert. (p. 27)
Use a problem solving plan and strategies to solve real-life problems. (1.5)	Find the average speed of the Bullet Train. (p. 33)
Solve and graph inequalities in one variable.	
• linear inequalities (1.6)	Decide how to spend your money at an amusement park. (p. 46)
• absolute value inequalities (1.7)	Describe recommended weight ranges for balls used in various sports. (p. 55)
Write and use algebraic models to solve real-life problems. (1.2–1.7)	Use femur length to find a range of possible heights for a person. (p. 55)

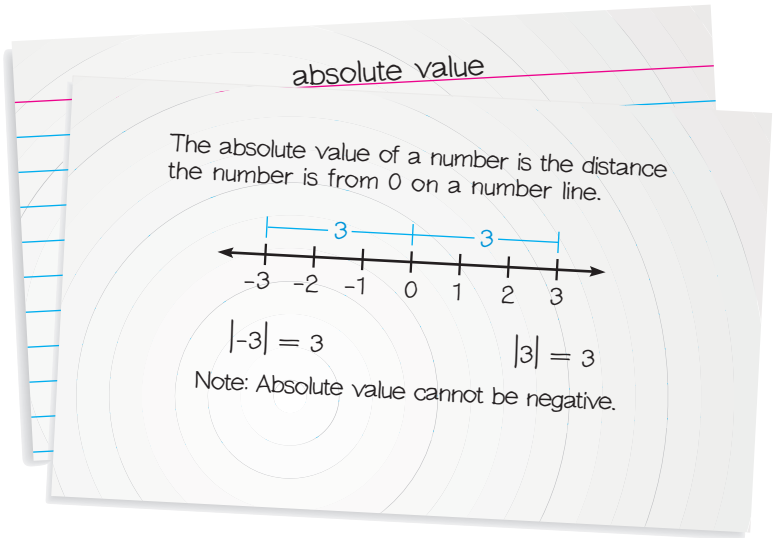
How does Chapter 1 fit into the BIGGER PICTURE of algebra?

Chapter 1 provides a review of skills and strategies you learned in Algebra 1 and a foundation for continuing your study of algebra and its applications. The primary use of algebra is to model and solve real-life problems. You will use algebra in this way throughout the course, in future courses, and perhaps in a future career.

STUDY STRATEGY

How did you make and use a vocabulary file?

Here is an example of one flashcard for your vocabulary file, following the **Study Strategy** on page 2.



CHAPTER 1

Chapter Review

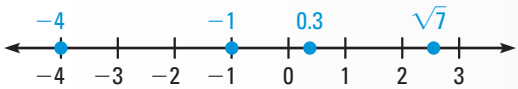
VOCABULARY

- whole numbers, p. 3
- integers, p. 3
- rational numbers, p. 3
- irrational numbers, p. 3
- origin, p. 3
- graph of a real number, p. 3
- coordinate, p. 3
- opposite, p. 5
- reciprocal, p. 5
- numerical expression, p. 11
- base, p. 11
- exponent, p. 11
- power, p. 11
- order of operations, p. 11
- variable, p. 12
- value of a variable, p. 12
- algebraic expression, p. 12
- value of an expression, p. 12
- mathematical model, p. 12
- terms of an expression, p. 13
- coefficient, p. 13
- like terms, p. 13
- constant terms, p. 13
- equivalent expressions, p. 13
- identity, p. 13
- equation, p. 19
- linear equation, p. 19
- solution of an equation, p. 19
- equivalent equations, p. 19
- verbal model, p. 33
- algebraic model, p. 33
- linear inequality in one variable, p. 41
- solution of a linear inequality in one variable, p. 41
- graph of a linear inequality in one variable, p. 41
- compound inequality, p. 43
- absolute value, p. 50

1.1 Real Numbers and Number Operations

Examples on pp. 3–6

EXAMPLE You can use a number line to graph and order real numbers.



Increasing order (left to right): $-4, -1, 0.3, \sqrt{7}$

Properties of real numbers include the closure, commutative, associative, identity, inverse, and distributive properties.

Graph the numbers on a number line. Then write the numbers in increasing order.

1. $-2, 0.2, -\pi, -\sqrt{6}, \frac{6}{5}$

2. $\frac{3}{4}, \sqrt{3}, -1.75, -3, -\frac{4}{3}$

Identify the property shown.

3. $4(5 + 1) = 4 \cdot 5 + 4 \cdot 1$

4. $8 + (-8) = 0$

1.2 Algebraic Expressions and Models

Examples on pp. 11–13

EXAMPLES You can use order of operations to evaluate expressions.

Numerical expression: $8(3 + 4^2) - 12 \div 2 = 8(3 + 16) - 6 = 8(19) - 6 = 152 - 6 = 146$

Algebraic expression: $3x^2 - 1$ when $x = -5$

$3(-5)^2 - 1 = 3(25) - 1 = 75 - 1 = 74$

Sometimes you can use the distributive property to simplify an expression.

Combine like terms: $2x^2 - 4x + 10x - 1 = 2x^2 + (-4 + 10)x - 1 = 2x^2 + 6x - 1$

Evaluate the expression.

5. $-3 - 6 \div 2 - 12$

6. $-5 \div 1 + 2(7 - 10)^2$

7. $7x - 3x - 8x^3$ when $x = -1$

8. $3ab^2 + 5a^2b - 1$ when $a = 2$ and $b = -2$

Simplify the expression.

9. $7y - 2x + 5x - 3y + 2x$

10. $4(3 - x) + 5(x - 6)$

11. $6x^2 - 3x + 5x^2 + 2x$

12. $2(x^2 + x) - 3(x^2 - 4x)$

1.3 SOLVING LINEAR EQUATIONS

Examples on pp. 19–21

EXAMPLE You can use properties of real numbers and transformations that produce equivalent equations to solve linear equations.

Solve: $-2(x - 4) = 12$

$-2x + 8 = 12$

$-2x = 4$

$x = -2$

Then check: $-2(-2 - 4) \stackrel{?}{=} 12$

$-2(-6) \stackrel{?}{=} 12$

$12 = 12$ ✓

Solve the equation. Check your solution.

13. $-5x + 3 = 18$

14. $\frac{2}{3}n - 5 = 1$

15. $\frac{1}{2}y = -\frac{3}{4}y - 40$

16. $2 - 3a = 4 + a$

17. $8(z - 6) = -16$

18. $-4x - 4 = 3(2 - x)$

1.4 REWRITING EQUATIONS AND FORMULAS

Examples on pp. 26–28

EXAMPLES You can solve an equation that has more than one variable, such as a formula, for one of its variables.

Solve the equation for y.

$2x - 3y = 6$

$-3y = -2x + 6$

$y = \frac{2}{3}x - 2$

Solve the formula for the area of a trapezoid for h.

$A = \frac{1}{2}(b_1 + b_2)h$

$2A = (b_1 + b_2)h$

$\frac{2A}{b_1 + b_2} = h$

Solve the equation for *y*.

19. $5x - y = 10$

20. $x + 4y = -8$

21. $0.1x + 0.5y = 3.5$

22. $2x = 3y + 9$

23. $5x - 6y + 12 = 0$

24. $x - 2xy = 1$

Solve the formula for the indicated variable.

25. Perimeter of a Rectangle

Solve for ℓ: $P = 2\ell + 2w$

26. Celsius to Fahrenheit

Solve for C: $F = \frac{9}{5}C + 32$

1.5 Problem Solving Using Algebraic Models

Examples on pp. 33–36

EXAMPLE You can use a problem solving plan in which you write a verbal model, assign labels, write and solve an algebraic model, and then answer the question.

How far can you drive at 55 miles per hour for 4 hours?

Verbal Model $\boxed{\text{Distance}} = \boxed{\text{Rate}} \cdot \boxed{\text{Time}}$

Labels Distance $= d$ (miles), Rate $= \mathbf{55}$ (miles per hour), Time $= \mathbf{4}$ (hours)

Algebraic Model $d = 55 \cdot 4 = 220$

▶ You can drive 220 miles.

27. How long will it take to drive 325 miles at 55 miles per hour?

28. While on vacation, you take a taxi from the airport to your hotel for \$21.85. The taxi costs \$2.95 plus \$1.35 per mile. How far is it from the airport to the hotel?

1.6 Solving Linear Inequalities

Examples on pp. 41–44

EXAMPLES You can use transformations to solve inequalities. Reverse the inequality when you multiply or divide both sides by a negative number.

$4x + 1 < 7x - 5$

$-3x < -6$

$x > 2$

$0 \le 6 - 2n \le 10$

$-6 \le -2n \le 4$

$3 \ge n \ge -2$

Solve the inequality. Then graph your solution.

29. $2x - 10 > 6$

30. $12 - 5x \ge -13$

31. $-3x + 4 \ge 2x + 19$

32. $0 < x - 7 \le 5$

33. $-3 \le 2y + 1 \le 5$

34. $3a + 1 < -2$ or $3a + 1 > 7$

1.7 Solving Absolute Value Equations and Inequalities

Examples on pp. 50–52

EXAMPLES To solve an absolute value equation, rewrite it as two linear equations. To solve an absolute value inequality, rewrite it as a compound inequality.

$|x + 3| = 5$

$x + 3 = 5$ or $x + 3 = -5$

$x = 2$ or $x = -8$

$|x - 7| \ge 2$

$x - 7 \ge 2$ or $x - 7 \le -2$

$x \ge 9$ or $x \le 5$

Solve the equation or inequality.

35. $|x + 1| = 4$

36. $|2x - 1| = 15$

37. $|10 - 6x| = 26$

38. $|x + 8| > 0$

39. $|2x - 5| < 9$

40. $|3x + 4| \ge 2$

CHAPTER 1

Chapter Test

Graph the numbers on a number line. Then write the numbers in increasing order.

1. $-0.98, -0.9, -1, -1.95$

2. $\frac{2}{3}, -\frac{3}{2}, -\frac{2}{3}, 0, \frac{3}{2}$

3. $\sqrt{4}, 4, 2\frac{3}{4}, \sqrt{10}, \frac{7}{2}$

Identify the property shown.

4. $7(11 + 9) = 7 \cdot 11 + 7 \cdot 9$

5. $8xy = 8yx$

6. $50 + 0 = 50$

Select and perform an operation to answer the question.

7. What is the product of -5 and -3?

8. What is the difference of 29 and -20?

Evaluate the expression.

9. $18 - 7 \cdot 15 \div 3$

10. $36 - 5^2 \cdot 2 + 7$

11. $12 - 3(1 - 17) \div 4$

12. $-4x^2 + 6xy$ when $x = -2$ and $y = 5$

13. $\frac{3}{5}x - \frac{7}{2}y$ when $x = 3$ and $y = 4$

Simplify the expression.

14. $-2x + 4y - 10 + x$

15. $4y + 6x - 3(x - 2y)$

16. $5(x^2 - 9x) - 2(3x + 4) + 7$

Solve the equation.

17. $7x + 12 = -16$

18. $1.2x = 2.3x - 2.2$

19. $4x + 21 = 7(x + 9)$

20. $|x - 4| = 15$

21. $|5x + 11| = 9$

22. $|13 + 2x| = 5$

Solve the equation for *y*.

23. $5x + y = 7$

24. $6x - 3y = 1$

25. $2xy + x = 12$

Solve the inequality. Then graph your solution.

26. $4x - 5 \leq 15$

27. $3 < 2x + 11 < 17$

28. $8x < 1$ or $x - 9 > -5$

29. $|3x - 1| > 7$

30. $|x + 3| \geq 4$

31. $|1 - 2x| \leq 3$

32. **GEOMETRY CONNECTION** The formula for the volume of a cylinder is $V = \pi r^2 h$. Solve the formula for h. How tall is a cylindrical can with radius 3 centimeters and volume 200 cubic centimeters?

33. **PHONE CALLS** A company charges \$.09 per minute for any long distance call, along with a \$5 monthly fee. Your monthly bill shows that you owe \$27.23. For how many minutes of long distance calls were you charged?

34. **SAVING MONEY** You plan to save \$15 per week from your allowance to buy a snowboard for \$400. How many *months* will it take?

35. **HOT WATER LAKE** Boiling Lake is a small lake on the island of Dominica. The water temperature of the lake is between 180°F and 197°F. Write a compound inequality for this temperature range. Graph the inequality.

36. **BASKETBALL BOUNCE** If manufactured correctly, a basketball should bounce from 48 inches to 56 inches when dropped from a height of 6 feet. Determine the tolerance for the bounce height of a basketball and write an absolute value inequality for acceptable bounce heights.