CHAPTER 1

Chapter Summary

WHAT did you learn?

WHY did you learn it?

Evaluate and write variable expressions. (1.1)	Estimate the time it will take you to hike the length of a trail and back. (p. 5)
Evaluate and write expressions containing exponents. (1.2)	Calculate the volume of water that a cubic aquarium holds. (p. 11)
Use the order of operations. (1.3)	Calculate sales tax on a purchase. (p. 18)
Use mental math to solve equations. (1.4)	Estimate the amount you owe for groceries. (p. 25)
Check solutions of inequalities. (1.4)	Check a pet's caloric intake. (p. 26)
Translate verbal phrases and sentences into expressions, equations, and inequalities. (1.5)	Calculate the total number of dim sum plates ordered at a restaurant. (p. 33)
Translate verbal models into algebraic models to solve problems. (1.5)	Model the decision-making of a commercial jet pilot. (p. 34)
Organize data using tables and graphs. (1.6)	Interpret information about eating habits in the United States. (pp. 40 and 41)
Use functions to show the relationship between inputs and outputs. (1.7)	Represent the rise of a hot-air balloon as a function. (p. 47)

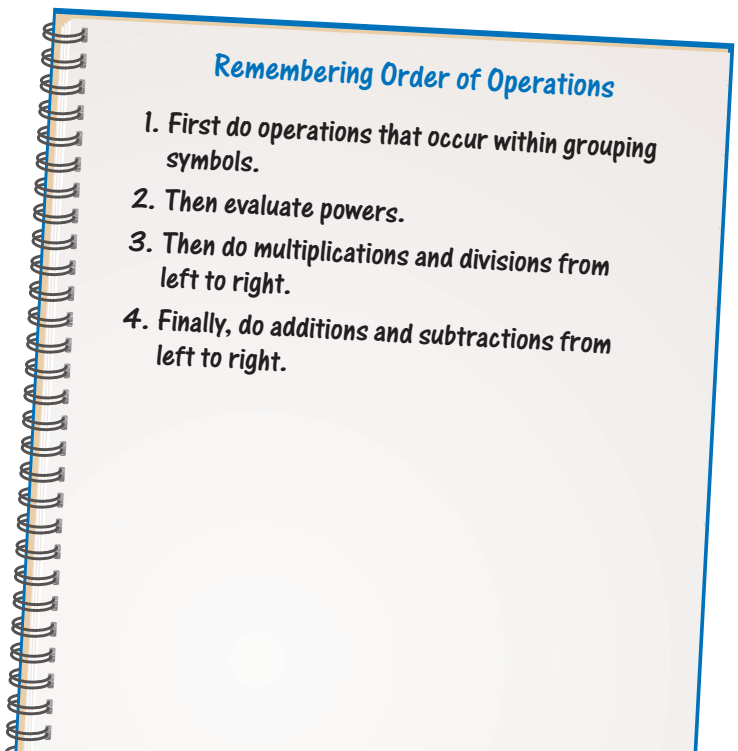
How does Chapter 1 fit into the BIGGER PICTURE of algebra?

In this chapter you were introduced to many of the terms and goals of algebra. Communication is a very important part of algebra, so it is important that algebraic terms become part of your vocabulary. Algebra is a language that you can use to solve real-life problems.

STUDY STRATEGY

How did you use the notes in your notebook?

The notes you made, using the **Study Strategy** on page 2, may include this one about order of operations.



CHAPTER 1

Chapter Review

VOCABULARY

- variable, p. 3
- values, p. 3
- variable expression, p. 3
- evaluating the expression, p. 3
- unit analysis, p. 5
- verbal model, p. 5
- power, p. 9
- exponent, p. 9
- base, p. 9
- grouping symbols, p. 10
- order of operations, p. 16
- equation, p. 24
- open sentence, p. 24
- solution of an equation, p. 24
- solving the equation, p. 25
- inequality, p. 26
- solution of an inequality, p. 26
- modeling, p. 33
- mathematical model, p. 33
- data, p. 40
- bar graph, p. 41
- line graph, p. 42
- function, p. 46
- input, p. 46
- output, p. 46
- input-output table, p. 46
- domain, p. 47
- range, p. 47

1.1 VARIABLES IN ALGEBRA

Examples on pp. 3–5

EXAMPLES Evaluate the expression when $y = 4$.

$10 - y = 10 - 4 = 6$

$11y = 11(4) = 44$

$\frac{16}{y} = \frac{16}{4} = 4$

$y + 9 = 4 + 9 = 13$

Evaluate the expression for the given value of the variable.

1. $a + 14$ when $a = 23$

2. $1.8x$ when $x = 10$

3. $\frac{m}{1.5}$ when $m = 15$

4. $\frac{15}{y}$ when $y = 7.5$

5. $p - 12$ when $p = 22$

6. $b(0.5)$ when $b = 9$

7. How long will it take to walk 6 miles if you walk at a rate of 3 miles per hour?

1.2 EXPONENTS AND POWERS

Examples on pp. 9–11

EXAMPLES Evaluate the expression when $b = 3$.

$b^2 = 3^2 = 3 \cdot 3 = 9$

$(10 - b)^3 = (10 - 3)^3 = 7^3 = 7 \cdot 7 \cdot 7 = 343$

$12(5^b) = 12(5^3) = 12(5 \cdot 5 \cdot 5) = 12(125) = 1500$

$b^4 + 18 = 3^4 + 18 = (3 \cdot 3 \cdot 3 \cdot 3) + 18 = 81 + 18 = 99$

Evaluate the expression.

8. eight to the fourth power

9. $(2 + 3)^5$

10. s^2 when $s = 1.5$

11. $6 + (b^3)$ when $b = 3$

12. $2x^4$ when $x = 2$

13. $(5x)^3$ when $x = 5$

1.3 Order of Operations

Examples on pp. 16–18

EXAMPLE Evaluate $550 - 4\,(3 + 5)^2$.

$$\begin{aligned} 550 - 4(3 + 5)^2 &= 550 - 4(8)^2 && \text{Evaluate within grouping symbols.} \\ &= 550 - 4 \cdot 64 && \text{Evaluate powers.} \\ &= 550 - 256 && \text{Multiply or divide.} \\ &= 294 && \text{Add or subtract.} \end{aligned}$$

Evaluate the expression.

14. $4 + 21 \div 3 - 3^2$ **15.** $(14 \div 7)^2 + 5$ **16.** $\dfrac{6 + 2^2}{17 - 6 \cdot 2}$ **17.** $\dfrac{x - 3y}{6}$ when $x = 15$ and $y = 2$

1.4 Equations and Inequalities

Examples on pp. 24–26

EXAMPLE You can check whether the number 4 is a solution of $5x + 3 = 18$.

4 is not a solution, because $5(4) + 3 \neq 18$.

Check whether the given number is a solution of the equation or inequality.

18. $2a - 3 = 2;\ 4$ **19.** $x^2 - x = 2;\ 2$ **20.** $9y - 3 > 24;\ 3$ **21.** $5x + 2 \leq 27;\ 5$

1.5 A Problem Solving Plan Using Models

Examples on pp. 32–34

EXAMPLE You can model problems like the following: If you can save \$5.25 a week, how many weeks must you save to buy a CD that costs \$15.75?

VERBAL MODEL

$$\text{Number of weeks} = \frac{\text{Cost of CD}}{\text{Amount saved per week}}$$

LABELS

Number of weeks = w (weeks)

Cost of CD = **15.75** (dollars)

Amount saved per week = **5.25** (dollars per week)

ALGEBRAIC MODEL

$$w = \frac{15.75}{5.25} \quad \text{Write algebraic model}$$

$$w = 3 \quad \text{Solve with mental math}$$

▶ You must save for 3 weeks.

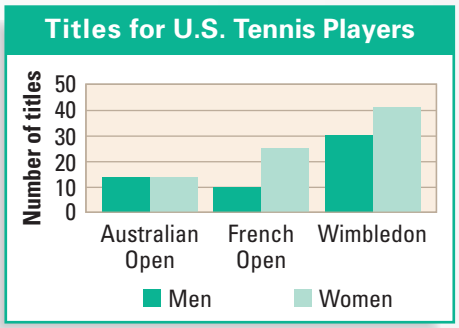
22. You are given \$75 to buy juice for the school dance. Each bottle of juice costs \$.75. Write a verbal and an algebraic model to find how many bottles of juice you can buy. Write an equation and use mental math to solve the equation.

1.6 TABLES AND GRAPHS

Examples on pp. 40–42

EXAMPLES Using the bar graph you can tell the following. From the vertical axis of the graph, you can see that male and female tennis players from the United States both have won the Australian Open 14 times.

You can also see that United States men have won the French Open 10 times, while United States women have won 25 times. So United States women have won 15 more French Open titles than the United States men.



Source: USA Today

In Exercises 23 and 24, use the graph above.

23. Compare the number of titles won by United States women at Wimbledon with the number won by United States men.

24. Find the total number of titles won by United States men and compare with the total for women.

Use the data in the table.

25. Make a line graph of the data.

26. What can you conclude from the line graph?

Percent of Voting-Age Population That Voted in Yearly Municipal Referendum, 1976–1996

Year	1976	1980	1984	1988	1992	1996
Percent	53.5	52.8	53.3	50.3	55.1	48.9

1.7 AN INTRODUCTION TO FUNCTIONS

Examples on pp. 46–48

EXAMPLES Line for your fishing reel costs \$.02 per yard. One lure costs \$3.50. Make an input-output table that shows the total cost of buying one lure and 100, 200, 300, or 400 yards of fishing line. The equation is $C = .02n + 3.50$, where n is the number of yards of fishing line. To find C Substitute the given values of n.

Fishing line (yards), n	100	200	300	400
Total (dollars), C	5.50	7.50	9.50	11.50

In Exercises 27–29, you are buying rectangular picture frames that have side lengths of $2w$ and $3w$.

27. Write an equation for the perimeter, starting with a verbal model.

28. Make an input-output table that shows the perimeter of the frames when $w = 1, 2, 3, 4,$ and 5.

29. Describe the domain and range of the function whose values are shown in the table.

CHAPTER 1

Chapter Test

Evaluate the expression when $y = 3$ and $x = 5$.

1. $5y + x^2$ **2.** $\frac{24}{y} - x$ **3.** $2y + 9x - 7$ **4.** $(5y + x) \div 4$

5. $2x^3 + 4y$ **6.** $8(x^2) \div 25$ **7.** $(x - y)^3$ **8.** $x^4 + 4(y - 2)$

In Exercises 9–11, write the expression in exponential form.

9. $5y \cdot 5y \cdot 5y \cdot 5y$ **10.** nine cubed **11.** six to the nth power

12. Insert grouping symbols in $5 \cdot 4 + 6 \div 2$ so that the value of the expression is 25.

13. **TRAVEL TIME** If you can travel only 35 miles per hour, is $2\frac{1}{2}$ hours enough time to get to a concert that is 85 miles away? Give the expression you used to find the answer.

Write an algebraic expression.

14. seven times a number **15.** x is at least ninety **16.** the quotient of m and two

In Exercises 17–22, decide whether the statement is *true* or *false*.

17. $(2 \cdot 3)^2 = 2 \cdot 3^2$ **18.** quotient of 3 and 12 is 4 **19.** $8 - 6 = 6 - 8$

20. 10% of \$38 is \$.38 **21.** $8 \leq y^2 + 3$ when $y = 3$ **22.** $9x > x^3$ when $x = 3$

23. The senior class is planning a trip that will cost \$35 per student. If \$3920 has been collected from the seniors for the trip, how many have paid for the trip?

MARCHING BAND In Exercises 24 and 25 members of the marching band are making their own color-guard flags. Each rectangular flag is 1.2 yards by 0.5 yard. The material costs \$1.75 per square yard.

24. Write a function showing the relationship between the number of flags and the cost of the material.

25. How much will it cost to make 20 flags?

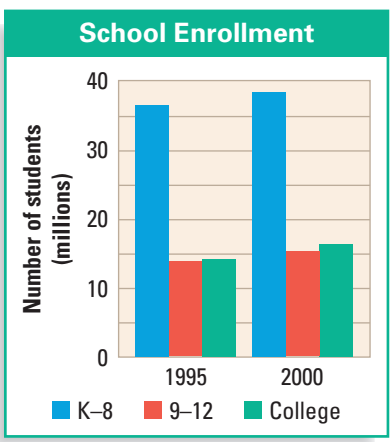
SCHOOL In Exercises 26–29 the bar graph shows the number of students enrolled in schools in the United States in 1995 and the number of students expected to be enrolled in 2000.

26. How many students are expected to be in kindergarten through eighth grade in 2000?

27. Describe why the K–8 category might be so much larger than 9–12 or College.

28. What group of students is expected to show the smallest change in enrollment from 1995 to 2000?

29. Is the number of students enrolled in school higher in 1995 or in the year 2000? How do you know?



Source: U.S. Bureau of the Census