

Glencoe McGraw-Hill

California
Mathematics
Grade 7

**Skills Practice
Workbook**



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TO THE STUDENT This *Skills Practice Workbook* gives you additional examples and problems for the concept exercises in each lesson. The exercises are designed to aid your study of mathematics by reinforcing important mathematical skills needed to succeed in the everyday world. The materials are organized by chapter and lesson, with one *Skills Practice* worksheet for every lesson in *Glencoe California Mathematics, Grade 7*.

Always keep your workbook handy. Along with your textbook, daily homework, and class notes, the completed *Skills Practice Workbook* can help you review for quizzes and tests.

TO THE TEACHER These worksheets are the same as those found in the Chapter Resource Masters for *Glencoe California Mathematics, Grade 7*. The answers to these worksheets are available at the end of each Chapter Resource Masters booklet as well as in your Teacher Wraparound Edition interleaf pages.



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CONTENTS

Lesson/Title	Page	Lesson/Title	Page
1-1	A Plan for Problem Solving1	4-8	Scale Drawings and Models.....35
1-2	Variables, Expressions, and Properties2	4-9	Rate of Change36
1-3	Integers and Absolute Value.....3	4-10	Constant Rate of Change.....37
1-4	Adding Integers4	5-1	Ratios and Percents38
1-5	Subtracting Integers5	5-2	Comparing Fractions, Decimals, and Percents39
1-6	Multiplying and Dividing Integers6	5-3	Algebra: The Percent Proportion40
1-7	Writing Equations7	5-4	Finding Percents Mentally41
1-8	Problem-Solving Investigation: Work Backward8	5-5	Problem-Solving Investigation: Reasonable Answers42
1-9	Solving Addition and Subtraction Equations9	5-6	Percent and Estimation43
1-10	Solving Multiplication and Division Equations10	5-7	Algebra: The Percent Equation44
2-1	Rational Numbers11	5-8	Percent of Change45
2-2	Comparing and Ordering Rational Numbers12	5-9	Simple Interest46
2-3	Multiplying Positive and Negative Fractions13	6-1	Line and Angle Relationships.....47
2-4	Dividing Positive and Negative Fractions14	6-2	Problem-Solving Investigation: Use Logical Reasoning48
2-5	Adding and Subtracting Like Fractions15	6-3	Polygons49
2-6	Adding and Subtracting Unlike Fractions16	6-4	Congruent Polygons50
2-7	Solving Equations with Rational Numbers17	6-5	Symmetry51
2-8	Problem-Solving Investigation: Look for a Pattern18	6-6	Reflections52
2-9	Powers and Exponents19	6-7	Translations53
2-10	Scientific Notation.....20	7-1	Circumference and Area of Circles54
3-1	Square Roots21	7-2	Problem-Solving Investigation: Solve a Simpler Problem55
3-2	Estimating Square Roots22	7-3	Area of Complex Figures56
3-3	Problem-Solving Investigation: Use a Venn Diagram23	7-4	Three-Dimensional Figures57
3-4	The Real Number System24	7-5	Volume of Prisms and Cylinders58
3-5	The Pythagorean Theorem25	7-6	Volume of Pyramids and Cones.....59
3-6	Using the Pythagorean Theorem26	7-7	Surface Area of Prisms and Cylinders60
3-7	Distance on the Coordinate Plane27	7-8	Surface Area of Pyramids.....61
4-1	Ratios and Rates28	7-9	Similar Solids62
4-2	Proportional and Nonproportional Relationships29	8-1	Simplifying Algebraic Expressions63
4-3	Solving Proportions30	8-2	Solving Two-Step Equations64
4-4	Problem-Solving Investigation: Draw a Diagram31	8-3	Writing Two-Step Equations65
4-5	Similar Polygons.....32	8-4	Solving Equations with Variables on Each Side66
4-6	Converting Measures33	8-5	Problem-Solving Investigation: Guess and Check.....67
4-7	Converting Square and Cubic Units of Measure34	8-6	Inequalities68
		8-7	Solving Inequalities by Adding or Subtracting69
		8-8	Solving Inequalities by Multiplying or Dividing.....70
		9-1	Functions71
		9-2	Representing Linear Functions72
		9-3	Slope73

Lesson/Title	Page	Lesson/Title.....	Page		
9-4	Direct Variation	74	11-2	Histograms	88
9-5	Slope-Intercept Form	75	11-3	Circle Graphs	89
9-6	Writing Systems of Equations and Inequalities	76	11-4	Measures of Central Tendency and Range	90
9-7	Problem-Solving Investigation: Use a Graph	77	11-5	Measures of Variation.....	91
9-8	Scatter Plots	78	11-6	Box-and-Whisker Plots.....	92
10-1	Linear and Nonlinear Functions	79	11-7	Stem-and-Leaf Plots.....	93
10-2	Graphing Quadratic Functions	80	11-8	Select an Appropriate Display	94
10-3	Problem-Solving Investigation: Make a Model.....	81	12-1	Counting Outcomes	95
10-4	Graphing Cubic Functions	82	12-2	Probability of Compound Events	96
10-5	Multiplying Monomials	83	12-3	Experimental and Theoretical Probability.....	97
10-6	Dividing Monomials	84	12-4	Problem-Solving Investigation: Act it Out.....	98
10-7	Powers of Monomials	85	12-5	Using Sampling to Predict	99
10-8	Roots of Monomials.....	86			
11-1	Problem-Solving Investigation: Make a Table	87			

A Plan for Problem Solving

Use the four-step plan to solve each problem.

1. **GAS MILEAGE** Each day Ernesto drives 52 miles. If he can drive 26 miles on one gallon of gasoline, how many days can he drive on 14 gallons of gasoline?

2. **FIELD TRIP** A school policy requires that there be at least one chaperone for every 8 students on a field trip. How many chaperones are required for a field trip with 67 students?

3. **EXERCISE** Trevor jogs every 3 days and swims every 4 days. How often does he jog and swim on the same day?

4. **PRODUCE** At the local grocery store, lemons are 52 cents each and limes are 21 cents each. How many lemons and limes can you buy for exactly \$3.75?

5. **PIZZA** The Chess Club sold 2,116 pizzas during a fundraiser that lasted for all of March, April, and May. How many pizzas did they sell per day?

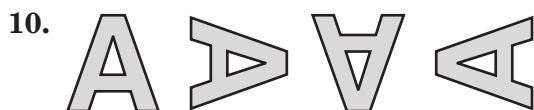
6. **GUPPIES** In January, Tate's fish tank had 12 guppies. In February, it had 18, and in March it had 24. How many guppies do you expect to be in Tate's fish tank in May?

Find a pattern in the list of numbers. Then find the next number in the list.

7. 1860, 1890, 1920, 1950, 1980

8. 1024, 256, 64, 16, 4

Draw the next two figures in each of the patterns below.



1-2**Skills Practice**

7AF1.2, 7AF1.3, 7AF1.4

Variables, Expressions, and Properties**Evaluate each expression.**

1. $10 \div 2 + 8$
2. $4(9) - 36 \div 3$
3. $24 - 12 \div 4$
4. $25 + 2 \cdot 8 \div 4$
5. $49 - (3^2 + 8 \cdot 3)$
6. $2(20 - 5) + \frac{34 - 14}{4}$
7. $(27 + 24)(27 - 24)$
8. $2^3 \div 4 + 3 \times 6$
9. $(4 + 4) \cdot 4 + 4 \div 4$
10. $3[(8 - 2) - 5] + 7$
11. $\frac{28 - 7}{4^2 - 13}$
12. $(15 - 9)^2 \div (5 + 4)$

Evaluate each expression if $n = 4$, $p = 3$, and $t = 6$.

13. $3n + p$
14. $t - 2p$
15. $3p - n + 4$
16. $(np)^2$
17. np^2
18. $5(2t - n)$
19. $p(n + t)$
20. $6t^2 - t$
21. $\frac{npt}{3}$
22. $4(pt - 3) \div n$
23. $\frac{p^2 + 4}{3t - 5}$
24. $\frac{pn^2}{t + 10}$
25. $n^2 - 3n + 8$
26. $2t^2 - t + 9$

Name the property shown by each statement.

27. $(4 + 5)3 = 4(3) + 5(3)$
28. $1 \cdot x^2 = x^2$
29. $2(bc) = (2b)c$
30. $(6 + 2) + 5 = 6 + (2 + 5)$
31. $2(bc) = 2(cb)$
32. $(4 + 5) + 0 = 4 + 5$
33. $13 + (5 + 10) = (5 + 10) + 13$
34. $3(7 - 2) = 3(7) - 3(2)$

1-3**Skills Practice**

7NS2.5

Integers and Absolute Value**Write an integer for each situation.**

- | | |
|-------------------------------|----------------------------------|
| 1. 3 strokes below par | 2. 10 strokes above par |
| 3. a 6-yard loss | 4. an 8-yard gain |
| 5. 12 centimeters longer | 6. 7 inches below normal |
| 7. \$5 off the original price | 8. a gain of 6 hours |
| 9. 2° above zero | 10. a loss of 15 pounds |
| 11. a \$35 withdrawal | 12. a \$75 deposit |
| 13. 1 mile above sea level | 14. 20 fathoms below the surface |

Replace each \bullet with $<$, $>$, or $=$ to make a true sentence.

- | | | |
|---------------------|------------------------|-------------------------|
| 15. $-12 \bullet 4$ | 16. $-4 \bullet -5$ | 17. $-10 \bullet -8$ |
| 18. $3 \bullet -13$ | 19. $ -6 \bullet 6 $ | 20. $ -4 \bullet -5 $ |

Order each set of integers in each set from least to greatest.

- | | |
|---------------------------|-------------------------------|
| 21. $\{0, -6, 7, 2, -4\}$ | 22. $\{-1, -2, -3, 3, 2, 1\}$ |
|---------------------------|-------------------------------|

Evaluate each expression.

- | | | |
|--------------------|--------------------|---------------------|
| 23. $ -8 $ | 24. $ 31 $ | 25. $ -1 $ |
| 26. $- -256 $ | 27. $ 3 + -19 $ | 28. $ -12 + -13 $ |
| 29. $ 28 - -26 $ | 30. $ 28 + -26 $ | 31. $ 24 - -15 $ |

Evaluate each expression if $a = 3$, $b = 8$, and $c = -5$.

- | | | |
|---------------|---------------|----------------|
| 32. $ a + 5$ | 33. $ b - 2$ | 34. $2 c + b$ |
| 35. $a + a $ | 36. $ 3b $ | 37. $ a + 16 $ |

1-4**Skills Practice****7NS1.2, 7AF1.3*****Adding Integers*****Add.**

1. $-2 + (-3)$

2. $4 + 7$

3. $-8 + 9$

4. $12 + (-3)$

5. $-27 + 18$

6. $-11 + (-13)$

7. $-44 + 26$

8. $44 + (-26)$

9. $-15 + (-51)$

10. $(-17) + (-13)$

11. $53 + (-28)$

12. $-86 + 77$

13. $10 + (-4) + 6$

14. $-16 + (-5) + 12$

15. $-2 + 17 + (-12)$

16. $-35 + (-31) + (-39)$

17. $8 + (-12) + 15 + (-13)$

18. $-23 + (-18) + 41 + (-17)$

Evaluate each expression if $a = -9$, $b = -12$, and $c = 8$.

19. $3 + a$

20. $b + 8$

21. $-6 + c$

22. $|a| + b$

23. $|a| + |c|$

24. $|b + c|$

Subtracting Integers**Subtract.**

1. $6 - 7$

2. $12 - 8$

3. $-9 - 9$

4. $-17 - 18$

5. $-13 - (-25)$

6. $14 - (-19)$

7. $-25 - 15$

8. $21 - (-23)$

9. $-34 - (-11)$

10. $56 - 94$

11. $38 - (-39)$

12. $72 - 27$

13. $-36 - 47$

14. $-33 - (-68)$

15. $76 - 18$

16. $4 - |-6|$

17. $|-10| - |7|$

18. $|-52| - 49$

Evaluate each expression if $k = 8$, $m = -7$, and $p = -10$.

19. $k - 19$

20. $19 - m$

21. $p - 11$

22. $k - m$

23. $p - m$

24. $m - 3$

25. $m - k$

26. $k - m + 16$

27. $k - m - p$

1-6**Skills Practice**

7NSI.2, 7AFI.3

Multiplying and Dividing Integers**Multiply.**

1. $-2 \cdot 3$

2. $3(-3)$

3. $-4(-2)$

4. $5 \cdot 7$

5. $-9(-8)$

6. $-11 \cdot 12$

7. $15(-3)$

8. $-7(-13)$

9. $-5(2)(-7)$

10. $(-10)^2$

11. $6(8)(-3)$

12. $(-4)^3$

13. $(-9)^2$

14. $-1(-3)(-4)$

15. $(-10)^3$

16. $-3(-4)(-7)$

Divide.

17. $-15 \div 3$

18. $40 \div (-5)$

19. $-63 \div (-7)$

20. $76 \div 4$

21. $\frac{-56}{-4}$

22. $\frac{-48}{16}$

23. $\frac{-57}{-19}$

24. $\frac{75}{-5}$

Evaluate each expression if $a = -2$, $b = 5$, and $c = -6$.

25. abc

26. $2b + c$

27. $\frac{2b - c}{a}$

28. $ab - c$

29. $\frac{c}{a + b}$

30. $\frac{2a + c}{b}$

31. $b^2 - 5a$

32. $(-c)^2$

Writing Equations

Write each verbal phrase as an algebraic expression.

1. a number divided by 5
2. the sum of d and 7
3. the product of 10 and c
4. the difference of t and 1
5. the score increased by 8 points
6. the cost split among 4 people
7. the cost of 7 CDs at $\$d$ each
8. the height decreased by 2 inches
9. $\$500$ less than the sticker price
10. the total of Ben's score and 75
11. 2 hours more than the estimate
12. 25 times the number of students

Write each verbal sentence as an algebraic equation.

13. The sum of a number and 16 is equal to 45.
14. The product of 6 and m is 216.
15. The difference of 100 and x is 57.
16. The quotient of z and 10 is equal to 32.
17. $\$12$ less than the original price is $\$48$.
18. 17 more than some number is equal to 85.
19. The number of members divided by 6 is 15.
20. The total of Joshua's savings and $\$350$ is $\$925$.
21. -65 is 5 times a number.
22. The total area decreased by 75 square feet is 250 square feet.
23. The cost of 10 books at $\$d$ each is $\$159.50$.
24. Carla's height plus 4 inches is 68 inches.

Problem-Solving Investigation: Work Backward

Use the work backward strategy to solve each problem.

- SKATEBOARDS** On Monday, David's skateboard shop received its first shipment of skateboards. David sold 12 skateboards that day. On Thursday, he sold 9 skateboards. On Friday, he received a shipment of 30 more skateboards and sold 10 skateboards. He then had a total of 32 skateboards in his shop. How many skateboards were delivered on Monday?
- SHIPPING** An overseas cargo ship was being loaded. At the end of each day, a scale showed the total weight of the ship's cargo. On Monday, 48 tons of cargo were loaded onto the ship. On Tuesday, three times as much cargo was loaded on to the ship as on Monday. On Wednesday, 68 tons of cargo were loaded onto the ship. On Thursday, 0.75 as much cargo was loaded onto the ship as on Wednesday. On Friday, 120 tons of cargo were loaded onto the ship. At the end of the day on Friday, the scale showed that the ship was carrying 690 tons of cargo. How much cargo was the ship carrying when it first came into port on Monday?
- NUMBERS** Jana is thinking of a number. If she divides her number by 12 and then multiplies the quotient by 8, the result is 520. What number is Jana thinking of?
- JOGGING** Edmund is training for a marathon. He ran a certain number of miles on Monday. On Wednesday, he ran 2 more miles than on Monday. On Saturday, he ran twice as far as on Wednesday. On Sunday, he ran 6 miles less than on Saturday. He ran 8 miles on Sunday. How many miles did Edmund run on Monday?

Use the table to solve each problem.

Airline Schedule Minneapolis, MN to Dallas, TX		
Flight Number	Departure Time	Arrival Time
253	8:20 A.M.	10:37 A.M.
142	11:52 A.M.	1:45 P.M.
295	12:00 P.M.	3:30 P.M.

- Charles needs to take Flight 295. He needs 45 minutes to eat breakfast and pack. It takes 25 minutes to get to the airport. To be at the airport 90 minutes early, what is the latest time he can start eating breakfast?
- Mrs. Gonzales left her office at 7:25 a.m. She planned that it would take her 30 minutes to get to the airport, but the traffic was so heavy it took an additional 20 minutes. It takes 30 minutes to check her baggage and walk to the boarding gate. What is the first flight she can take to Dallas?

Solving Addition and Subtraction Equations**Solve each equation. Check your solution.**

1. $x + 3 = 4$

2. $y + 6 = 5$

3. $t - 2 = 2$

4. $z - 5 = 1$

5. $a + 4 = -3$

6. $h - 3 = -6$

7. $u - 4 = -1$

8. $8 + d = 14$

9. $19 = x + 7$

10. $17 = b - 8$

11. $-19 = z - 21$

12. $22 = y + 29$

13. $16 = 24 + p$

14. $-17 = 19 + x$

15. $f - 25 = 35$

16. $y + 37 = 59$

17. $s + 46 = 72$

18. $m + 65 = 11$

19. $r + 53 = -19$

20. $n - 75 = 42$

21. $g - 35 = -62$

22. $111 = x + 68$

23. $-54 = -32 + w$

24. $-27 + z = 47$

1-10**Skills Practice**

6AF1.1

Solving Multiplication and Division Equations**Solve each equation. Check your solution.**

1. $\frac{u}{7} = 3$

2. $3c = 12$

3. $5x = -15$

4. $-7z = 49$

5. $\frac{n}{3} = -7$

6. $\frac{a}{-9} = -11$

7. $-14g = -56$

8. $\frac{t}{-12} = 11$

9. $18y = -144$

10. $135 = 9z$

11. $11d = -143$

12. $116 = -29k$

13. $\frac{w}{9} = 17$

14. $-14 = \frac{y}{-7}$

15. $-112 = -8v$

16. $17c = 136$

17. $-21a = -126$

18. $\frac{s}{-19} = 9$

19. $\frac{m}{-31} = -7$

20. $16q = 272$

21. $15 = \frac{z}{-14}$

22. $\frac{g}{-22} = -23$

23. $\frac{y}{25} = 16$

24. $47k = 517$

2-1**Skills Practice**

7NS1.3, 7NS1.5

Rational Numbers**Write each fraction or mixed number as a decimal.**

1. $\frac{1}{10}$

2. $\frac{1}{8}$

3. $-\frac{3}{4}$

4. $-\frac{4}{5}$

5. $\frac{21}{50}$

6. $-3\frac{9}{20}$

7. $4\frac{9}{25}$

8. $\frac{7}{9}$

9. $1\frac{1}{6}$

10. $-2\frac{4}{15}$

11. $\frac{5}{33}$

12. $7\frac{3}{11}$

Write each decimal as a fraction or mixed number in simplest form.

13. 0.9

14. 0.7

15. 0.84

16. 0.92

17. -1.12

18. -5.05

19. 2.35

20. 8.85

21. $-0.\overline{1}$

22. $4.\overline{8}$

23. $6.\overline{7}$

24. $-8.\overline{4}$

2-2**Skills Practice**

7NS1.1

Comparing and Ordering Rational NumbersReplace each ● with $<$, $>$, or $=$ to make a true sentence.

1. $\frac{1}{2}$ ● $\frac{3}{4}$

2. $\frac{1}{3}$ ● $\frac{1}{6}$

3. $\frac{2}{5}$ ● $\frac{3}{10}$

4. $\frac{2}{9}$ ● $\frac{1}{3}$

5. $\frac{3}{4}$ ● $\frac{9}{12}$

6. $\frac{3}{8}$ ● $\frac{2}{5}$

7. $-\frac{5}{6}$ ● $-\frac{6}{7}$

8. $-\frac{4}{9}$ ● $-\frac{5}{11}$

9. $\frac{5}{9}$ ● 0.55

10. 4.72 ● $4\frac{10}{13}$

11. $-2\frac{7}{15}$ ● -2.45

12. 5.25 ● $5.\overline{25}$

13. -1.62 ● $-1\frac{5}{8}$

14. $11\frac{4}{9}$ ● $11.\overline{4}$

15. $-1.\overline{27}$ ● $-1.2\overline{7}$

Order each set of rational numbers from least to greatest.

16. 0.3, 0.2, $\frac{1}{3}$, $\frac{2}{9}$

17. $1\frac{2}{5}$, $1\frac{2}{3}$, 1.55, 1.67

18. 2.7, $2\frac{1}{7}$, 3.13, $1\frac{9}{10}$

19. $\frac{1}{4}$, -1.7, 0.2, $-1\frac{3}{4}$

20. -2.21, -2.09, $-2\frac{1}{9}$, $-1\frac{10}{11}$

21. -3.1, 2.75, $1\frac{7}{8}$, $-\frac{2}{3}$

22. $6\frac{7}{8}$, $6\frac{15}{16}$, 6.9, 5.3

23. $-4\frac{1}{6}$, -4.19, -5.3, $-5\frac{1}{3}$

24. $5\frac{9}{11}$, 5.93, $5\frac{7}{20}$, 5.81

25. $-3\frac{1}{4}$, $-4\frac{1}{8}$, -3.65, $-3\frac{4}{11}$, -4.05

2-3**Skills Practice**

7NS1.2, 7MG1.3

Multiplying Positive and Negative Fractions**Multiply. Write in simplest form.**

1. $\frac{1}{8} \cdot \frac{2}{3}$

2. $\frac{2}{9} \cdot \frac{7}{8}$

3. $\frac{5}{6} \cdot \frac{3}{11}$

4. $-\frac{4}{7} \cdot \frac{3}{10}$

5. $\frac{2}{9} \cdot \left(-\frac{3}{8}\right)$

6. $-\frac{3}{5} \cdot \left(-\frac{5}{9}\right)$

7. $1\frac{3}{4} \cdot \frac{2}{3}$

8. $\frac{4}{5} \cdot 4\frac{3}{8}$

9. $-\frac{2}{15} \cdot 5\frac{5}{6}$

10. $-1\frac{3}{7} \cdot 1\frac{1}{5}$

11. $-2\frac{1}{4} \cdot 1\frac{2}{3}$

12. $1\frac{9}{16} \cdot 2\frac{4}{5}$

13. $-3\frac{1}{7} \cdot \left(-1\frac{2}{11}\right)$

14. $2\frac{2}{3} \cdot \left(-2\frac{1}{4}\right)$

15. $\left(-\frac{4}{5}\right)\left(-\frac{4}{5}\right)$

ALGEBRA Evaluate each expression if $r = \frac{5}{6}$, $s = -\frac{1}{3}$, $t = \frac{4}{5}$, and $v = -\frac{3}{4}$.

16. rv

17. st

18. rs

19. stv

20. rst

21. rtv

ALGEBRA Evaluate each expression if $a = -\frac{5}{9}$, $b = -\frac{1}{5}$, $c = \frac{2}{3}$, and $d = \frac{3}{4}$.

22. ad

23. bc

24. abc

2-4**Skills Practice**

7NS1.2, 7MG1.3

Dividing Positive and Negative Fractions

Write the multiplicative inverse of each number.

1. $\frac{2}{3}$

2. $-\frac{4}{7}$

3. $-\frac{1}{12}$

4. 22

5. $\frac{9}{35}$

6. $-\frac{14}{17}$

7. $1\frac{5}{7}$

8. $-1\frac{3}{13}$

9. $2\frac{3}{7}$

10. $-3\frac{6}{11}$

11. $4\frac{8}{15}$

12. $5\frac{3}{5}$

Divide. Write in simplest form.

13. $\frac{3}{7} \div \frac{3}{5}$

14. $\frac{2}{7} \div \frac{6}{7}$

15. $-\frac{5}{8} \div \frac{3}{4}$

16. $\frac{7}{9} \div \left(-\frac{14}{15}\right)$

17. $-\frac{4}{5} \div \frac{8}{9}$

18. $\frac{2}{11} \div \frac{4}{9}$

19. $1\frac{3}{4} \div 2\frac{1}{2}$

20. $-2\frac{3}{5} \div 1\frac{3}{10}$

21. $-3\frac{4}{7} \div \left(-1\frac{1}{14}\right)$

22. $\frac{10}{11} \div 5$

23. $-4 \div \frac{3}{5}$

24. $3\frac{4}{15} \div 4\frac{2}{3}$

25. $9\frac{1}{3} \div 5\frac{3}{5}$

26. $-12\frac{3}{4} \div \left(-2\frac{5}{6}\right)$

27. $2\frac{4}{9} \div \left(-6\frac{2}{7}\right)$

28. $-11\frac{1}{5} \div 3\frac{1}{9}$

2-5**Skills Practice**

7NS1.2

Adding and Subtracting Like Fractions**Add or subtract. Write in simplest form.**

1. $\frac{1}{5} + \frac{3}{5}$

2. $\frac{2}{9} + \frac{5}{9}$

3. $\frac{7}{11} + \frac{3}{11}$

4. $-\frac{1}{4} + \frac{3}{4}$

5. $-\frac{4}{9} + \frac{8}{9}$

6. $-\frac{5}{7} + \frac{2}{7}$

7. $\frac{7}{12} + \frac{5}{12}$

8. $\frac{1}{9} + \left(-\frac{4}{9}\right)$

9. $-\frac{5}{7} + \left(-\frac{3}{7}\right)$

10. $-\frac{9}{16} + \left(-\frac{3}{16}\right)$

11. $\frac{5}{8} - \frac{3}{8}$

12. $\frac{13}{19} - \frac{6}{19}$

13. $\frac{2}{7} - \frac{6}{7}$

14. $\frac{4}{15} - \frac{7}{15}$

15. $\frac{1}{9} - \left(-\frac{4}{9}\right)$

16. $\frac{3}{13} - \left(-\frac{11}{13}\right)$

17. $2\frac{3}{7} + 1\frac{2}{7}$

18. $1\frac{4}{15} + 4\frac{8}{15}$

19. $5\frac{6}{7} - 3\frac{2}{7}$

20. $6\frac{7}{12} - 3\frac{1}{12}$

21. $-2\frac{5}{11} - 7\frac{1}{11}$

22. $-4\frac{3}{8} - 2\frac{7}{8}$

23. $5\frac{2}{9} - 2\frac{4}{9}$

24. $8\frac{1}{5} - 4\frac{2}{5}$

2-6**Skills Practice**

7NS1.2, 7NS2.2

Adding and Subtracting Unlike Fractions

Add or subtract. Write in simplest form.

1. $\frac{1}{6} + \frac{1}{2}$

2. $\frac{4}{9} + \frac{1}{3}$

3. $\frac{7}{8} + \frac{1}{4}$

4. $\frac{3}{4} + \frac{2}{3}$

5. $\frac{6}{7} - \frac{3}{14}$

6. $\frac{4}{5} - \frac{1}{3}$

7. $\frac{1}{4} - \frac{5}{6}$

8. $-\frac{3}{5} + \frac{1}{4}$

9. $-\frac{3}{7} - \frac{2}{3}$

10. $\frac{4}{7} - \left(-\frac{1}{2}\right)$

11. $3\frac{2}{5} + 2\frac{1}{3}$

12. $5\frac{5}{7} + 3\frac{1}{2}$

13. $3\frac{1}{6} + 4\frac{1}{4}$

14. $1\frac{1}{2} + \left(-1\frac{1}{5}\right)$

15. $2\frac{3}{4} + \left(-6\frac{3}{8}\right)$

16. $5\frac{1}{4} + \left(-2\frac{2}{3}\right)$

17. $-5\frac{1}{12} - 3\frac{2}{3}$

18. $-3\frac{3}{5} - \frac{9}{10}$

19. $-2\frac{1}{5} - 3\frac{3}{4}$

20. $2\frac{1}{3} - \left(-4\frac{5}{6}\right)$

21. $3\frac{2}{7} - \left(-4\frac{2}{3}\right)$

22. $5\frac{7}{9} - \left(-2\frac{1}{3}\right)$

23. $10\frac{2}{9} - \left(-3\frac{1}{3}\right)$

24. $-2\frac{1}{3} - \left(-5\frac{4}{5}\right)$

2-7 Skills Practice

7AF1.1, 7NS1.2

Solving Equations with Rational Numbers

Solve each equation. Check your solution.

1. $x + 2.62 = 6.37$

2. $y - 3.16 = 7.92$

3. $-3.38 = r - 9.76$

4. $s + \frac{5}{8} = \frac{7}{8}$

5. $-\frac{5}{6} = x - \frac{1}{3}$

6. $-\frac{4}{5} + z = \frac{1}{10}$

7. $3.4c = 6.8$

8. $-1.56 = 0.26w$

9. $12.8y = 6.4$

10. $\frac{3}{4}x = 9$

11. $\frac{4}{9} = \frac{8}{11}a$

12. $-\frac{2}{5}s = \frac{4}{15}$

13. $-\frac{2}{3} = \frac{3}{10}t$

14. $-\frac{4}{11}w = -\frac{19}{22}$

15. $5.1 = -1.7r$

16. $z - (-3.2) = 3.69$

17. $-2.11 = w - (-5.81)$

18. $\frac{w}{2.6} = 3.5$

19. $-\frac{x}{1.8} = 7.2$

20. $2\frac{1}{4}y = 3\frac{3}{8}$

21. $-2\frac{2}{5}f = -3\frac{1}{5}$

22. $1.5d = \frac{3}{8}$

23. $-7.5g = -6\frac{2}{3}$

24. $-2\frac{1}{5} = c - \left(-\frac{4}{5}\right)$

2-8

Skills Practice

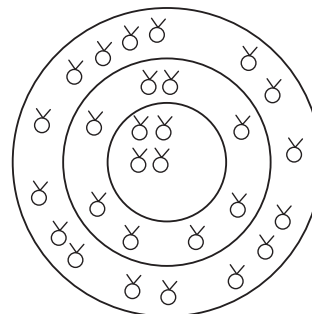
7MR2.4, 7NS1.2

Problem-Solving Investigation: Look for a Pattern

Look for a pattern. Then use the pattern to solve each problem.

1. **YARN** A knitting shop is having a huge yarn sale. One skein sells for \$1.00, 2 skeins sell for \$1.50, and 3 skeins sell for \$2.00. If this pattern continues, how many skeins of yarn can you buy for \$5.00?

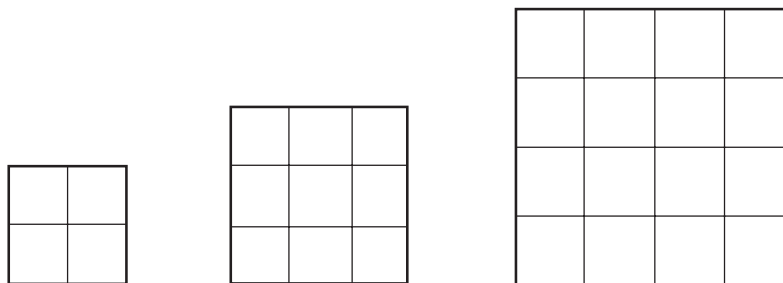
2. **BIOLOGY** Biologists place sensors in 8 concentric circles to track the movement of grizzly bears throughout Yellowstone National Park. Four sensors are placed in the inner circle. Eight sensors are placed in the next circle. Sixteen sensors are placed in the third circle, and so on. If the pattern continues, how many sensors are needed in all?



3. **HONOR STUDENTS** A local high school displays pictures of the honor students from each school year on the office wall. The top row has 9 pictures displayed. The next 3 rows have 7, 10, and 8 pictures displayed. The pattern continues to the bottom row, which has 14 pictures in it. How many rows of pictures are there on the office wall?

4. **CHEERLEADING** The football cheerleaders will arrange themselves in rows to form a pattern on the football field at halftime. In the first five rows there are 12, 10, 11, 9, and 10 girls in each row. They will form a total of twelve rows. If the pattern continues, how many girls will be in the back row?

5. **GEOMETRY** Find the perimeters of the next two figures in the pattern. The length of each side of each small square is 3 feet.



6. **HOT TUBS** A hot tub holds 630 gallons of water when it is full. A hose fills the tub at a rate of 6 gallons every five minutes. How long will it take to fill the hot tub?

2-9**Skills Practice**

7NS1.2, 7NS2.1, 7AF2.1

Powers and Exponents**Write each expression using exponents.**

1. $2 \cdot 2 \cdot 2 \cdot 2$

2. $9 \cdot 9$

3. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$

4. $x \cdot x \cdot x$

5. $c \cdot c \cdot c \cdot c \cdot c \cdot c$

6. $s \cdot s \cdot s \cdot s \cdot s \cdot s \cdot s \cdot s$

7. $5 \cdot 5 \cdot 5 \cdot 3 \cdot 3$

8. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 6 \cdot 6 \cdot 6$

9. $8 \cdot 8 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 8$

10. $a \cdot a \cdot b \cdot a \cdot b \cdot a \cdot a$

11. $m \cdot n \cdot n \cdot n \cdot m \cdot n$

12. $y \cdot x \cdot x \cdot y \cdot x \cdot y \cdot y$

Evaluate each expression.

13. 4^3

14. 2^5

15. 8^3

16. 5^4

17. 2^8

18. $2^3 \cdot 5^2$

19. $4^2 \cdot 3^4$

20. $2^6 \cdot 6^2$

21. $3^3 \cdot 7^3$

22. 2^{-3}

23. 8^{-2}

24. 7^{-4}

2-10**Skills Practice**

7NS1.1

Scientific Notation**Write each number in standard form.**

1. 6.7×10^1

2. 6.1×10^4

3. 1.6×10^3

4. 3.46×10^2

5. 2.91×10^5

6. 8.651×10^7

7. 3.35×10^{-1}

8. 7.3×10^{-6}

9. 1.49×10^{-7}

10. 4.0027×10^{-4}

11. 5.2277×10^{-3}

12. 8.50284×10^{-2}

Write each number in scientific notation.

13. 34

14. 273

15. 79,700

16. 6,590

17. 4,733,800

18. 2,204,000,000

19. 0.00916

20. 0.29

21. 0.00000571

22. 0.0008331

23. 0.0121

24. 0.00000018

3-1**Skills Practice**

7NS2.4

Square Roots

Find each square root.

1. $\sqrt{16}$

2. $-\sqrt{9}$

3. $\sqrt{36}$

4. $\sqrt{196}$

5. $\sqrt{121}$

6. $-\sqrt{81}$

7. $-\sqrt{0.04}$

8. $\sqrt{289}$

9. $\sqrt{0.81}$

10. $-\sqrt{400}$

11. $\sqrt{\frac{16}{49}}$

12. $\sqrt{\frac{49}{100}}$

ALGEBRA Solve each equation.

13. $s^2 = 81$

14. $t^2 = 36$

15. $x^2 = 49$

16. $256 = z^2$

17. $900 = y^2$

18. $1,024 = h^2$

19. $c^2 = \frac{49}{64}$

20. $a^2 = \frac{25}{121}$

21. $\frac{1}{100} = d^2$

22. $\frac{144}{169} = r^2$

23. $b^2 = \frac{9}{441}$

24. $x^2 = \frac{121}{400}$

3-2**Skills Practice**

7NS2

Estimating Square Roots**Estimate to the nearest whole number.**

1. $\sqrt{5}$

2. $\sqrt{18}$

3. $\sqrt{10}$

4. $\sqrt{34}$

5. $\sqrt{53}$

6. $\sqrt{80}$

7. $\sqrt{69}$

8. $\sqrt{99}$

9. $\sqrt{120}$

10. $\sqrt{77}$

11. $\sqrt{171}$

12. $\sqrt{230}$

13. $\sqrt{147}$

14. $\sqrt{194}$

15. $\sqrt{290}$

16. $\sqrt{440}$

17. $\sqrt{578}$

18. $\sqrt{730}$

19. $\sqrt{1,010}$

20. $\sqrt{1,230}$

21. $\sqrt{8.42}$

22. $\sqrt{17.8}$

23. $\sqrt{11.5}$

24. $\sqrt{37.7}$

25. $\sqrt{23.8}$

26. $\sqrt{59.4}$

27. $\sqrt{97.3}$

28. $\sqrt{118.4}$

29. $\sqrt{84.35}$

30. $\sqrt{45.92}$

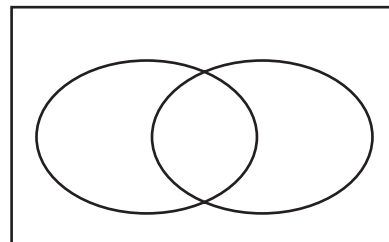
3-3**Skills Practice**

7MR2.5, 7NS1.2

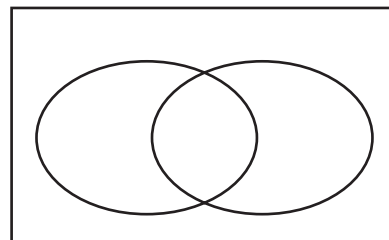
Problem Solving Investigation: Use a Venn Diagram

Use a Venn diagram to solve each problem.

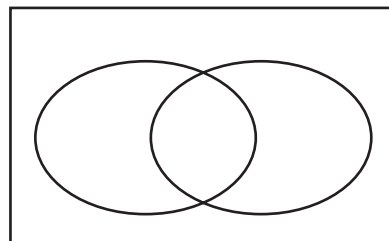
- 1. PHONE SERVICE** Of the 5,750 residents of Homer, Alaska, 2,330 pay for landline phone service and 4,180 pay for cell phone service. One thousand seven hundred fifty pay for both landline and cell phone service. How many residents of Homer do not pay for any type of phone service?



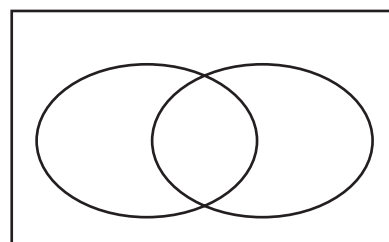
- 2. BIOLOGY** Of the 2,890 ducks living in a particular wetland area, scientists find that 1,260 have deformed beaks, while 1,320 have deformed feet. Six hundred ninety of the birds have both deformed feet and beaks. How many of the ducks living in the wetland area have no deformities?



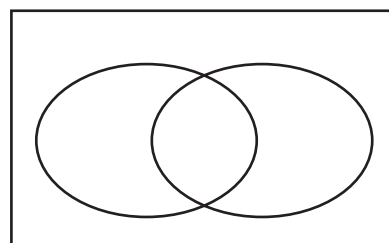
- 3. FLU SYMPTOMS** The local health agency treated 890 people during the flu season. Three hundred fifty of the patients had flu symptoms, 530 had cold symptoms, and 140 had both cold and flu symptoms. How many of the patients treated by the health agency had no cold or flu symptoms?



- 4. HOLIDAY DECORATIONS** During the holiday season, 13 homes on a certain street displayed lights and 8 displayed lawn ornaments. Five of the homes displayed both lights and lawn ornaments. If there are 32 homes on the street, how many had no decorations at all?



- 5. LUNCHTIME** At the local high school, 240 students reported they have eaten the cafeteria's hot lunch, 135 said they have eaten the cold lunch, and 82 said they have eaten both the hot and cold lunch. If there are 418 students in the school, how many bring lunch from home?



3-4**Skills Practice**

7NS1.4

The Real Number System

Name all sets of numbers to which each real number belongs.

1. 12

2. -15

3. $1\frac{1}{2}$

4. 3.18

5. $\frac{8}{4}$

6. $9.\bar{3}$

7. $-2\frac{7}{9}$

8. $\sqrt{25}$

9. $\sqrt{3}$

10. $-\sqrt{64}$

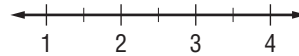
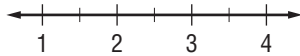
11. $-\sqrt{12}$

12. $\sqrt{13}$

Estimate each square root to the nearest tenth. Then graph the square root on a number line.

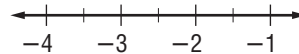
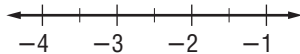
13. $\sqrt{5}$

14. $\sqrt{14}$



15. $-\sqrt{6}$

16. $-\sqrt{13}$

Replace each \bullet with $<$, $>$, or $=$ to make a true sentence.

17. $1.7 \bullet \sqrt{3}$

18. $\sqrt{6} \bullet 2\frac{1}{2}$

19. $4\frac{2}{5} \bullet \sqrt{19}$

20. $4.\bar{8} \bullet \sqrt{24}$

21. $6\frac{1}{6} \bullet \sqrt{38}$

22. $\sqrt{55} \bullet 7.4\bar{2}$

23. $2.1 \bullet \sqrt{4.41}$

24. $2.\bar{7} \bullet \sqrt{7.7}$

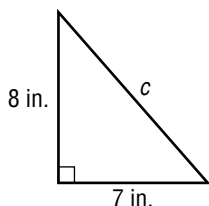
3-5**Skills Practice**

7MG3.3, 7MR3.2

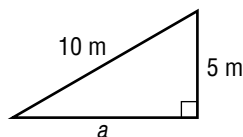
The Pythagorean Theorem

Write an equation you could use to find the length of the missing side of each right triangle. Then find the missing length. Round to the nearest tenth if necessary.

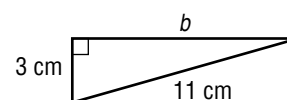
1.



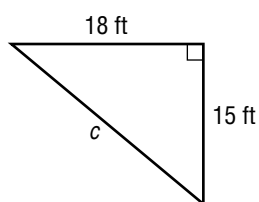
2.



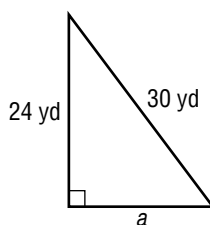
3.



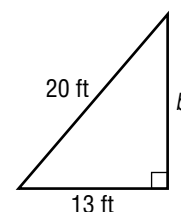
4.



5.



6.



7. $a = 1 \text{ m}, b = 3 \text{ m}$

8. $a = 2 \text{ in.}, c = 5 \text{ in.}$

9. $b = 4 \text{ ft}, c = 7 \text{ ft}$

10. $a = 4 \text{ km}, b = 9 \text{ km}$

11. $a = 10 \text{ yd}, c = 18 \text{ yd}$

12. $b = 18 \text{ ft}, c = 20 \text{ ft}$

13. $a = 5 \text{ yd}, b = 11 \text{ yd}$

14. $a = 12 \text{ cm}, c = 16 \text{ cm}$

15. $b = 22 \text{ m}, c = 25 \text{ m}$

16. $a = 21 \text{ ft}, b = 72 \text{ ft}$

17. $a = 36 \text{ yd}, c = 60 \text{ yd}$

18. $b = 25 \text{ mm}, c = 65 \text{ mm}$

Determine whether each triangle with sides of given lengths is a right triangle.

19. 10 yd, 15 yd, 20 yd

20. 21 ft, 28 ft, 35 ft

21. 7 cm, 14 cm, 16 cm

22. 40 m, 42 m, 58 m

23. 24 in., 32 in., 38 in.

24. 15 mm, 18 mm, 24 mm

3-6

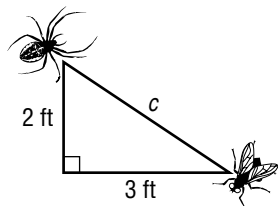
Skills Practice

7MG3.3

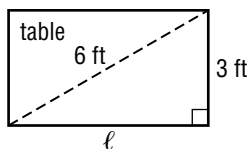
Using the Pythagorean Theorem

Write an equation that can be used to answer the question. Then solve. Round to the nearest tenth if necessary.

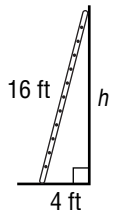
1. How far apart are the spider and the fly?



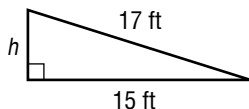
2. How long is the tabletop?



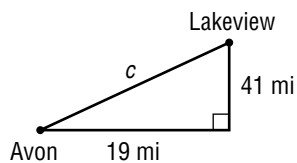
3. How high will the ladder reach?



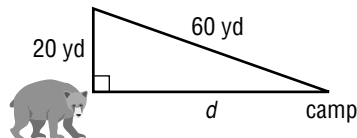
4. How high is the ramp?



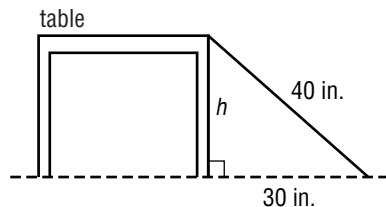
5. How far apart are the two cities?



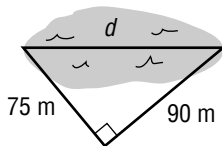
6. How far is the bear from camp?



7. How tall is the table?



8. How far is it across the pond?

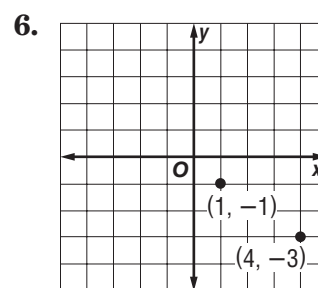
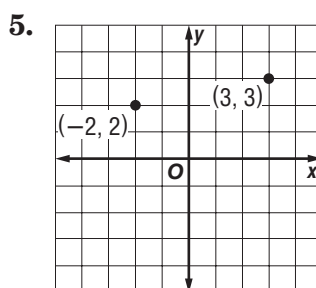
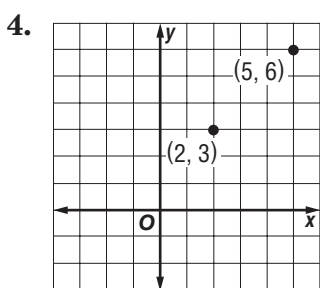
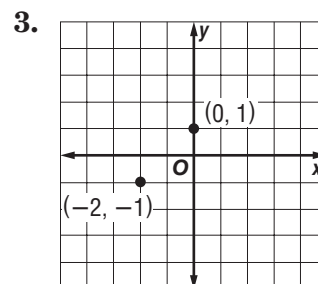
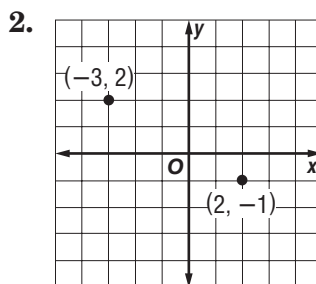
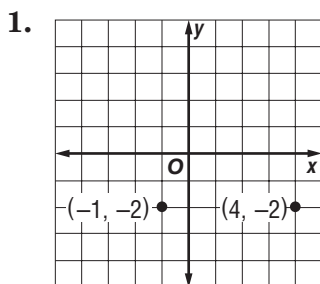


3-7 Skills Practice

7MG3.2

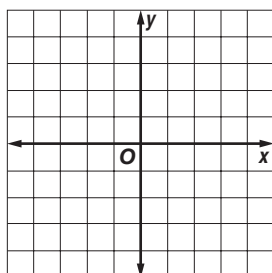
Distance on the Coordinate Plane

Find the distance between each pair of points whose coordinates are given. Round to the nearest tenth if necessary.

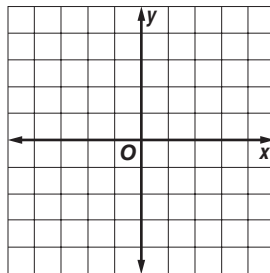


Graph each pair of ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

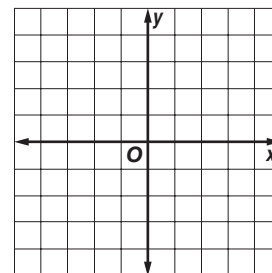
7. $(-3, 0), (3, -2)$



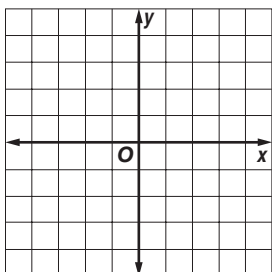
8. $(-4, -3), (2, 1)$



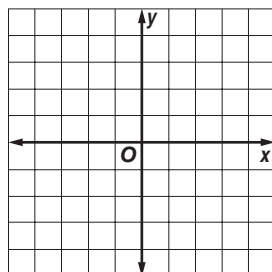
9. $(0, 2), (5, -2)$



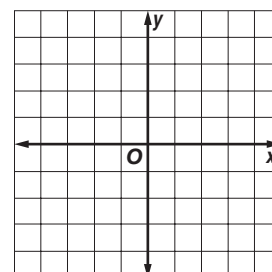
10. $(-2, 1), (-1, 2)$



11. $(0, 0), (-4, -3)$



12. $(-3, 4), (2, -3)$



4-1**Skills Practice****7AF4.2, 7MG1.3*****Ratios and Rates*****Express each ratio in simplest form.**

1. 15 cats:50 dogs
2. 18 adults to 27 teens
3. 27 nurses to 9 doctors
4. 12 losses in 32 games
5. 50 centimeters:1 meter
6. 1 foot:1 yard
7. 22 players:2 teams
8. \$28:8 pounds
9. 8 completions:12 passes
10. 21 hired out of 105 applicants
11. 18 hours out of 1 day
12. 64 boys to 66 girls
13. 66 miles on 4 gallons
14. 48 wins:18 losses
15. 112 peanuts:28 cashews
16. 273 miles in 6 hours

Express each rate as a unit rate.

17. 96 students in 3 buses
18. \$9,650 for 100 shares of stock
19. \$21.45 for 13 gallons of gasoline
20. 125 meters in 10 seconds
21. 30.4 pounds of tofu in 8 weeks
22. 6.5 inches of rainfall in 13 days
23. 103.68 miles in 7.2 hours
24. \$94.99 for 7 pizzas

4-2 Skills Practice

7AF3.4

Proportional and Nonproportional Relationships

For Exercises 1–3, use the table of values. Write the ratios in the table to show the relationship between each set of values.

1.	Number of Hours	1	2	3	4
	Total Amount Earned	\$15	\$30	\$45	\$60
	Ratios				

2.	Number of Packages	1	2	3	4
	Total Cost	\$11	\$20	\$29	\$38
	Ratios				

3.	Number of Classrooms	1	2	3	4
	Total Students	24	48	72	92
	Ratios				

For Exercises 4–8 use the table of values. Write *proportional* or *nonproportional*.

4.	Number of Hours	1	2	3	4
	Total Amount Earned	\$0.99	\$1.98	\$2.97	\$3.96

5.	Number of Hours	1	2	3	4
	Total Amount Earned	\$17.25	\$35.50	\$50.75	\$70

6.	Number of Hours	1	2	3	4
	Number of Pages Read in Book	37	73	109	145

7.	Number of Lunches	1	2	3	4
	Total Cost	\$2.75	\$5.50	\$8.25	\$11

8. Jack is ordering pies for a family reunion. Each pie costs \$4.50. For orders smaller than a dozen pies, there is a \$5 delivery charge. Is the cost proportional to the number of pies ordered?

4-3**Skills Practice**

7AF4.2

Solving Proportions**Determine whether each pair of ratios forms a proportion.**

1. $\frac{5}{8}, \frac{2}{3}$

2. $\frac{7}{3}, \frac{14}{6}$

3. $\frac{6}{8}, \frac{9}{12}$

4. $\frac{16}{9}, \frac{11}{6}$

5. $\frac{55}{10}, \frac{12}{2}$

6. $\frac{6}{8}, \frac{15}{20}$

7. $\frac{5}{9}, \frac{15}{27}$

8. $\frac{3}{18}, \frac{11}{66}$

9. $\frac{7}{11}, \frac{15}{23}$

10. $\frac{9}{13}, \frac{13}{17}$

11. $\frac{3}{42}, \frac{5}{70}$

12. $\frac{6}{7}, \frac{36}{49}$

Solve each proportion.

13. $\frac{4}{12} = \frac{y}{9}$

14. $\frac{6}{18} = \frac{4}{c}$

15. $\frac{7}{z} = \frac{84}{12}$

16. $\frac{5}{10} = \frac{8}{w}$

17. $\frac{x}{9} = \frac{4}{15}$

18. $\frac{6}{20} = \frac{y}{5}$

19. $\frac{5}{9} = \frac{6}{r}$

20. $\frac{8}{n} = \frac{10}{7}$

21. $\frac{d}{5} = \frac{12}{80}$

22. $\frac{y}{5} = \frac{13}{10}$

23. $\frac{2}{28} = \frac{p}{35}$

24. $\frac{11}{t} = \frac{100}{11}$

25. $\frac{1.2}{m} = \frac{3}{5}$

26. $\frac{0.9}{1.5} = \frac{a}{10}$

27. $\frac{3}{7} = \frac{k}{4.2}$

28. $\frac{6.3}{x} = \frac{18}{5}$

29. $\frac{3.6}{9} = \frac{b}{0.5}$

30. $\frac{14}{1.5} = \frac{4.2}{y}$

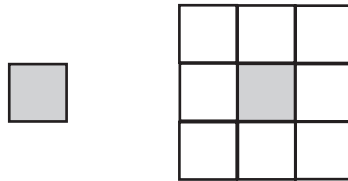
4-4**Skills Practice**

7MR2.5, 7AF4.2

Problem-Solving Investigation: Draw a Diagram

For Exercises 1–5, use the draw a diagram strategy to solve the problem.

- 1. AQUARIUM** An aquarium holds 60 gallons of water. After 6 minutes, the tank has 15 gallons of water in it. How many more minutes will it take to fill the tank?
- 2. TILING** Meredith has a set of ninety 1-inch tiles. If she starts with one tile, then surrounds it with a ring of tiles to create a larger square, how many surrounding rings can she make before she runs out of tiles?



- 3. SEWING** Judith has a 30-yard by 1-yard roll of fabric. She needs to use 1.5 square yards to create one costume. How many costumes can she create?
- 4. DRIVING** It takes 3 gallons of gas to drive 102 miles. How many miles can be driven on 16 gallons of gas?
- 5. PACKING** Hector can fit 75 compact discs into 5 boxes. How many compact discs can he fit into 14 boxes?

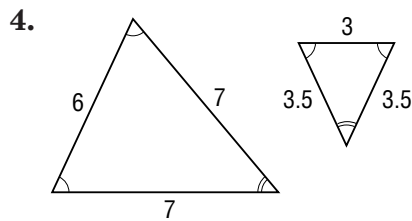
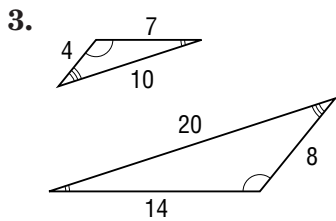
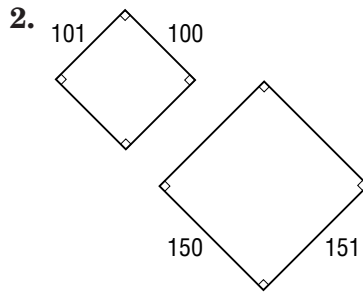
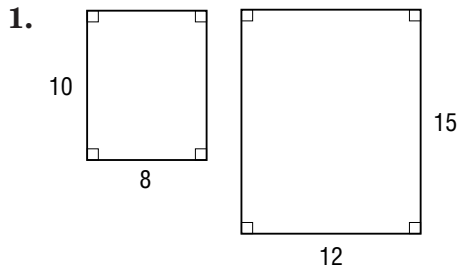
4-5

Skills Practice

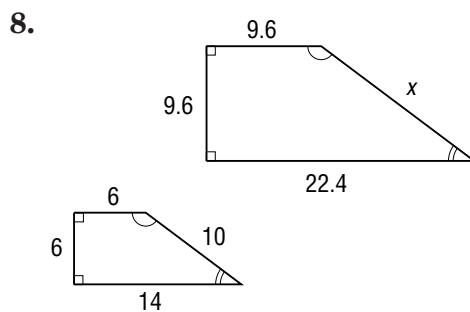
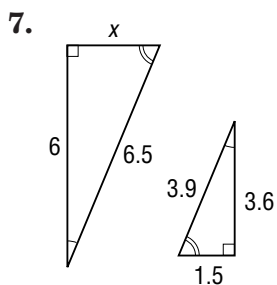
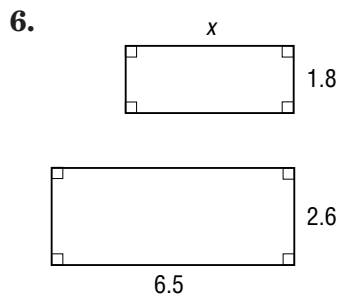
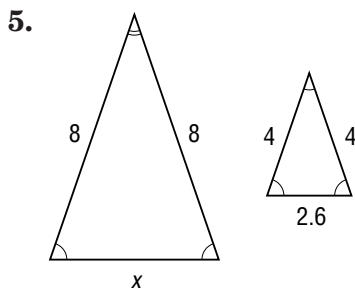
6NS1.3

Similar Polygons

Determine whether each pair of polygons is similar. Explain.



Each pair of polygons is similar. Write a proportion to find each missing measure. Then solve.



4-6 Skills Practice**7MG1.1****Converting Measures****Complete each conversion.**

1. 5 lb = ■ oz

2. 7 pt = ■ qt

3. 1,720 cm = ■ m

4. $3\frac{1}{2}$ days = ■ hr

5. 15 ft = ■ yd

6. 4.5 L = ■ mL

7. 0.5 g = ■ mg

8. 8,500 mm = ■ m

9. $2\frac{1}{2}$ T = ■ lb

10. 15 qt = ■ gal

11. 470 mg = ■ g

12. 2.75 km = ■ m

13. $2\frac{1}{4}$ c = ■ fl oz

14. 240 sec = ■ min

Complete each conversion. Round to the nearest hundredth if necessary.

15. 4 km \approx ■ mi

16. 3 fl oz \approx ■ mL

17. 26 ft \approx ■ m

18. $5\frac{1}{2}$ gal \approx ■ L

19. 1.25 oz \approx ■ g

20. 75 lb \approx ■ kg

21. 27 pt \approx ■ L

22. 52 mi \approx ■ km

23. 3 T \approx ■ kg

24. 50 yd \approx ■ m

25. 2 lb \approx ■ g

26. 13 in. \approx ■ cm

27. $15 \frac{\text{lb}}{\text{hr}} \approx \blacksquare \frac{\text{g}}{\text{sec}}$

28. $23 \frac{\text{kg}}{\text{hr}} \approx \blacksquare \frac{\text{oz}}{\text{min}}$

29. $96 \frac{\text{fl oz}}{\text{day}} \approx \blacksquare \frac{\text{mL}}{\text{min}}$

30. $5 \frac{\text{mi}}{\text{day}} \approx \blacksquare \frac{\text{m}}{\text{hr}}$

4-7 Skills Practice

7MG1.1, 7MG2.4

Converting Square and Cubic Units of Measure**Complete each conversion.**

1. $1,500 \text{ cm}^2 = \blacksquare \text{ m}^2$
2. $288 \text{ in}^2 = \blacksquare \text{ ft}^2$
3. $0.5 \text{ yd}^2 = \blacksquare \text{ ft}^2$
4. $0.75 \text{ m}^2 = \blacksquare \text{ cm}^2$
5. $370 \text{ mm}^2 = \blacksquare \text{ cm}^2$
6. $243 \text{ ft}^2 = \blacksquare \text{ yd}^2$
7. $2.5 \text{ ft}^2 = \blacksquare \text{ in}^2$
8. $25 \text{ cm}^2 = \blacksquare \text{ mm}^2$
9. $0.2 \text{ m}^3 = \blacksquare \text{ cm}^3$
10. $567 \text{ ft}^3 = \blacksquare \text{ yd}^3$
11. $0.5 \text{ ft}^3 = \blacksquare \text{ in}^3$
12. $1.5 \text{ cm}^3 = \blacksquare \text{ mm}^3$
13. $5,750 \text{ cm}^3 = \blacksquare \text{ m}^3$
14. $5,184 \text{ in}^3 = \blacksquare \text{ ft}^3$

Complete each conversion. Round to the nearest hundredth if necessary.

15. $4 \text{ km}^2 \approx \blacksquare \text{ mi}^2$
16. $10 \text{ in}^2 \approx \blacksquare \text{ cm}^2$
17. $15 \text{ yd}^2 \approx \blacksquare \text{ m}^2$
18. $3.5 \text{ m}^2 \approx \blacksquare \text{ ft}^2$
19. $27 \text{ mi}^2 \approx \blacksquare \text{ km}^2$
20. $12 \text{ cm}^2 \approx \blacksquare \text{ in}^2$
21. $125 \text{ ft}^2 \approx \blacksquare \text{ m}^2$
22. $0.5 \text{ in}^2 \approx \blacksquare \text{ mm}^2$
23. $45 \text{ m}^2 \approx \blacksquare \text{ yd}^2$
24. $22.5 \text{ km}^2 \approx \blacksquare \text{ mi}^2$
25. $4.25 \text{ yd}^2 \approx \blacksquare \text{ m}^2$
26. $925 \text{ mm}^2 \approx \blacksquare \text{ in}^2$
27. $5 \text{ m}^3 \approx \blacksquare \text{ yd}^3$
28. $20 \text{ in}^3 \approx \blacksquare \text{ cm}^3$
29. $3,500 \text{ cm}^3 \approx \blacksquare \text{ in}^3$
30. $27 \text{ yd}^3 \approx \blacksquare \text{ m}^3$
31. $55 \text{ ft}^3 \approx \blacksquare \text{ m}^3$
32. $5,250 \text{ cm}^3 \approx \blacksquare \text{ ft}^3$
33. $25.5 \text{ m}^3 \approx \blacksquare \text{ yd}^3$
34. $12 \text{ m}^3 \approx \blacksquare \text{ ft}^3$

4-8 Skills Practice

7MG1.2

Scale Drawings and Models

ARCHITECTURE The scale on a set of architectural drawings for a house is 1.5 inches = 2 feet. Find the length of each part of the house.

	Room	Drawing Length	Actual Length
1.	Living Room	15 inches	
2.	Dining Room	10.5 inches	
3.	Kitchen	$12\frac{3}{4}$ inches	
4.	Laundry Room	$8\frac{1}{4}$ inches	
5.	Hall	$13\frac{7}{8}$ inches	
6.	Garage	16.5 inches	

7. What is the scale factor of these drawings?

TOWN PLANNING For Exercises 8–11, use the following information.

As part of a downtown renewal project, businesses have constructed a scale model of the town square to present to the city commission for its approval. The scale of the model is 1 inch = 7 feet.

8. The courthouse is the tallest building in the town square. If it is $5\frac{1}{2}$ inches tall in the model, how tall is the actual building?
9. The business owners would like to install new lampposts that are each 12 feet tall. How tall are the lampposts in the model?
10. In the model, the lampposts are $3\frac{3}{7}$ inches apart. How far apart will they be when they are installed?
11. What is the scale factor?
12. **MAPS** On a map, two cities are $6\frac{1}{2}$ inches apart. The actual distance between the cities is 104 miles. What is the scale of the map?

4-9**Skills Practice**

7AF3.4

Rate of Change

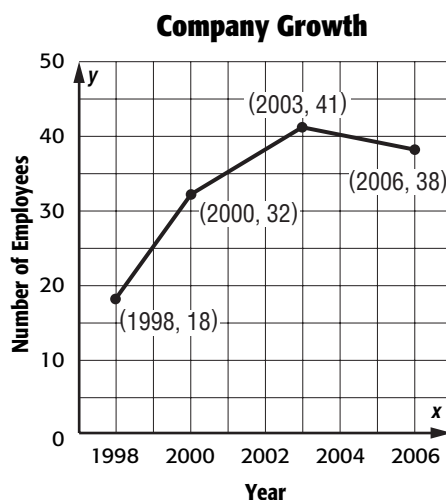
TEMPERATURE Use the table below that shows the high temperature of a city for the first part of August.

Date	1	5	14	15
High Temperature (°F)	85	93	102	102

- Find the rate of change in the high temperature between August 1 and August 5.
- Find the rate of change in the high temperature between August 5 and August 14.
- During which of these two time periods did the high temperature rise faster?
- Find the rate of change in the high temperature between August 14 and August 15. Then interpret its meaning.

COMPANY GROWTH Use the graph that shows the number of employees at a company between 1998 and 2006.

- Find the rate of change in the number of employees between 1998 and 2000.
- Find the rate of change in the number of employees between 2000 and 2003.
- During which of these two time periods did the number of employees grow faster?
- Find the rate of change in the number of employees between 2003 and 2006. Then interpret its meaning.



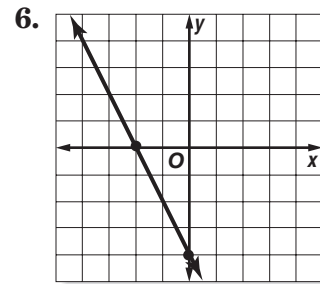
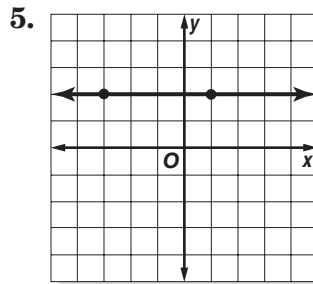
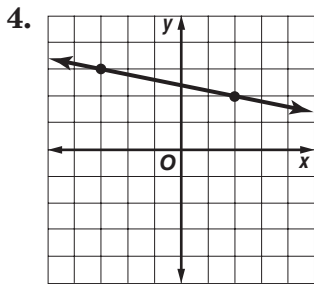
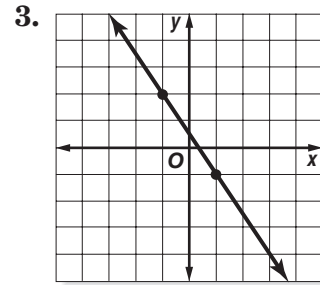
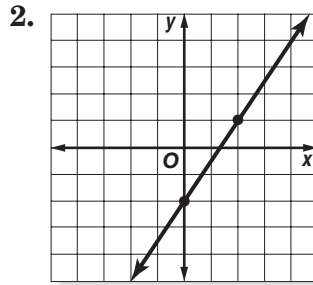
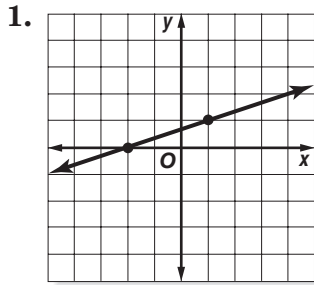
4-10

Skills Practice

7AF3.4

Constant Rate of Change

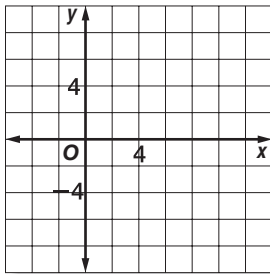
Find the rate of change for each line.



The points given in each table lie on a line. Find the rate of change for the line. Then graph the line.

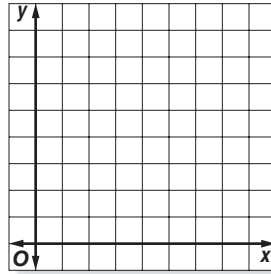
7.

x	0	3	6	9
y	1	2	3	4



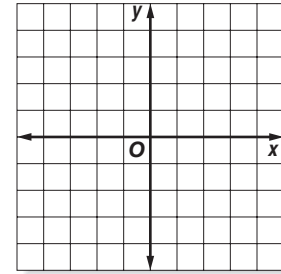
8.

x	1	3	5	7
y	6	5	4	3



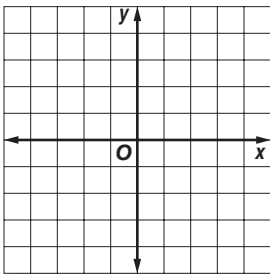
9.

x	-2	-1	0	1
y	2	1	0	-1



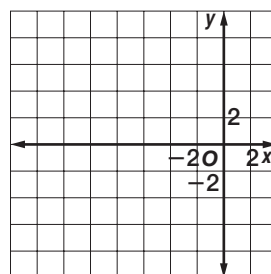
10.

x	-4	-2	0	2
y	3	3	3	3



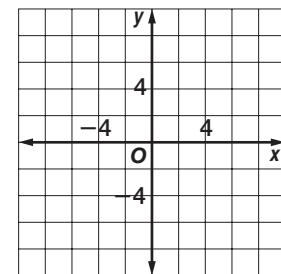
11.

x	-7	-5	-3	-1
y	-6	-3	0	3



12.

x	-8	-4	0	4
y	8	5	2	-1



5-1**Skills Practice****7NS1.3****Ratios and Percents****Write each ratio or fraction as a percent.**

1. 3 out of 100
2. 49 out of 100
3. 73 out of 100
4. 0.9 out of 100
5. 99 out of 100
6. 2:4
7. 2:10
8. 1:20
9. 19:25
10. 31:50
11. $\frac{8}{10}$
12. $\frac{3}{4}$
13. $\frac{7}{50}$
14. $\frac{13}{25}$
15. $\frac{19}{20}$
16. $\frac{3}{8}$

Write each percent as a fraction in simplest form.

17. 31%
18. 51%
19. 67%
20. 89%
21. 97%
22. 50%
23. 90%
24. 26%
25. 85%
26. 36%
27. 94%
28. 48%
29. 15%
30. 92%
31. 54%
32. 12.5%

5-2**Skills Practice**

7NS1.1, 7NS1.3

Comparing Fractions, Decimals, and Percents**Write each percent as a decimal.**

1. 50%

2. 13%

3. 26%

4. 41%

5. 79%

6. 9.1%

7. 17.5%

8. 33.4%

9. 91.5%

10. 122%

11. 282%

12. 331%

Write each decimal as a percent.

13. 0.6

14. 0.05

15. 0.17

16. 0.38

17. 0.81

18. 0.453

19. 0.572

20. 0.737

21. 0.061

22. 1.19

23. 1.47

24. 2.38

Write each fraction as a percent.

25. $\frac{9}{20}$

26. $\frac{2}{25}$

27. $\frac{5}{16}$

28. $\frac{33}{40}$

29. $\frac{3}{80}$

30. $\frac{13}{16}$

31. $\frac{17}{40}$

32. $\frac{59}{80}$

33. $\frac{14}{10}$

34. $\frac{28}{25}$

35. $\frac{9}{4}$

36. $\frac{33}{20}$

5-3**Skills Practice**

7NS1.3

Algebra: The Percent Proportion

**Write a percent proportion and solve each problem.
Round to the nearest tenth if necessary.**

1. 1 is what percent of 5?
2. What number is 25% of 40?
3. 30 is 60% of what number?
4. What percent of 8 is 6?
5. Find 15% of 20.
6. 33 is 33% of what number?
7. 15 is what percent of 150?
8. What number is 30% of 140?
9. 90 is 60% of what number?
10. What percent of 60 is 42?
11. Find 90% of 40.
12. 21 is 35% of what number?
13. 36 is what percent of 45?
14. What number is 75% of 44?
15. 12 is 40% of what number?
16. What percent of 40 is 15?
17. Find 5% of 80.
18. 45 is 60% of what number?
19. 46 is what percent of 69?
20. Find 55% of 120.
21. 11 is 44% of what number?
22. 19 is what percent of 20?
23. What number is 85% of 40?
24. 9 is 18% of what number?

5-4 Skills Practice

7NS1.3

Finding Percents Mentally**Compute mentally.**

1. 50% of 40
2. 25% of 36
3. 10% of 60
4. 1% of 100
5. 20% of 15
6. 40% of 30
7. $33\frac{1}{3}\%$ of 21
8. $12\frac{1}{2}\%$ of 32
9. 75% of 28
10. 10% of 230
11. 90% of 30
12. $83\frac{1}{3}\%$ of 18
13. 1% of 300
14. $62\frac{1}{2}\%$ of 24
15. 60% of 45
16. 70% of 50
17. $16\frac{2}{3}\%$ of 48
18. 10% of 66
19. 30% of 70
20. 1% of 240
21. $66\frac{2}{3}\%$ of 51
22. 10% of 45
23. 1% of 73
24. 10% of 12.4
25. 1% of 18.9
26. 10% of 107
27. 1% of 153
28. $87\frac{1}{2}\%$ of 72
29. $83\frac{1}{3}\%$ of 54
30. $62\frac{1}{2}\%$ of 64

5-5**Skills Practice**

7MR3.1, 7NS1.3

Problem-Solving Investigation: Reasonable Answers

For Exercises 1–12, estimate and rewrite the problem to determine a reasonable answer.

1. 53% of 813

2. 27% of 456

3. 87% of 1,978

4. 11% of 176

5. 67% of 543

6. 8% of 697

7. 81% of 2,211

8. 48% of 762

9. 4% of 4,874

10. 23% of 584

11. 45% of 1,252

12. 32% of 620

For Exercises 13–24, estimate and rewrite the problem to determine a reasonable answer.

13. $\$54.87 + \28.97

14. $\$22.38 + \46.12

15. $\$94.67 + \17.78

16. $\$88.88 + \36.32

17. $\$7.87 + \48.31

18. $\$74.78 + \75.18

19. $\$37.42 + \85.01

20. $\$28.69 + \35.09

21. $\$108.24 + \127.95

22. $\$89.99 + \79.99

23. $\$217.87 + \186.65

24. $\$46.22 + \86.86

5-6**Skills Practice**

7NS1.3

Percent and Estimation**Estimate.**

1. 9% of 40

2. 20% of 16

3. 76% of 36

4. 31% of 80

5. 33% of 46

6. 26% of 79

7. 89% of 31

8. 42% of 54

9. 11% of 89

10. 79% of 66

11. 72% of 109

12. 19% of 116

Estimate each percent.

13. 6 out of 29

14. 7 out of 27

15. 12 out of 17

16. 44 out of 50

17. 4 out of 41

18. 9 out of 28

19. 9 out of 19

20. 10 out of 26

21. 29 out of 41

22. 37 out of 46

23. 17 out of 23

24. 7 out of 11

5-7 Skills Practice

7NSI.3, 7NSI.7

Algebra: The Percent Equation

Solve each problem using the percent equation.

1. Find 50% of 40.
2. What is 90% of 20?
3. What percent of 64 is 16?
4. 24 is what percent of 30?
5. Find 20% of 55.
6. What is 60% of 45?
7. 16 is 40% of what number?
8. 70% of what number is 63?
9. What percent of 84 is 63?
10. 9 is what percent of 30?
11. 35 is 10% of what number?
12. 15% of what number is 24?
13. What percent of 2,000 is 4?
14. 5 is what percent of 1,000?
15. What percent of 3,000 is 9?
16. 16 is what percent of 4,000?
17. What percent of 2,000 is 14?
18. What is 120% of 20?
19. What percent of 5,000 is 20?
20. What is 140% of 60?
21. Find 250% of 40.
22. 2% of what number is 5?
23. Find 175% of 28.
24. 6% of what number is 21?
25. 12 is 10% of what number?
26. 5% of what number is 20?
27. 75 is 20% of what number?
28. 15% of what number is 42?

Percent of Change

Find each percent of change. Round to the nearest tenth of a percent if necessary. State whether the percent of change is an *increase* or a *decrease*.

1. original: 4
new: 6

2. original: 35
new: 28

3. original: 80
new: 52

4. original: 45
new: 63

5. original: 120
new: 132

6. original: 210
new: 105

7. original: 84
new: 111

8. original: 91
new: 77

Find the selling price for each item given the cost to the store and the markup.

9. suit: \$200, 50% markup

10. tire: \$50, 40% markup

11. sport bag: \$40, 30% markup

12. radio: \$120, 25% markup

13. grill: \$85, 15% markup

14. microwave: \$96, 20% markup

15. chair: \$140, 45% markup

16. camcorder: \$350, 33% markup

17. camera: \$245, 10% markup

18. diamond ring: \$470, 35% markup

Find the sale price of each item to the nearest cent.

19. shoes: \$70, 10% off

20. artwork: \$250, 20% off

21. speakers: \$180, 30% off

22. bicycle: \$320, 25% off

23. antique chest: \$179, 15% off

24. pendant: \$93.50, 5% off

25. sofa: \$749.95, 35% off

26. oven: \$535.99, 20% off

27. guitar: \$488.20, 25% off

28. weight machine: \$919.70, 10% off

5-9**Skills Practice****7NS1.7****Simple Interest****Find the simple interest to the nearest cent.**

1. \$500 at 4% for 2 years
2. \$800 at 9% for 4 years
3. \$350 at 6.2% for 3 years
4. \$280 at 5.5% for 4 years
5. \$740 at 3.25% for 2 years
6. \$1,150 at 7.6% for 5 years
7. \$725 at 4.3% for $2\frac{1}{2}$ years
8. \$266 at 5.2% for 3 years
9. \$955 at 6.75% for $3\frac{1}{4}$ years
10. \$1,245 at 5.4% for 4 years
11. \$1,540 at 8.25% for 2 years
12. \$2,180 at 7.7% for $2\frac{1}{2}$ years
13. \$3,500 at 4.2% for $1\frac{3}{4}$ years
14. \$2,650 at 3.65% for $4\frac{1}{2}$ years

Find the total amount in each account to the nearest cent.

15. \$200 at 5% for 3 years
16. \$700 at 6% for 2 years
17. \$850 at 4% for 3 years
18. \$350 at 8% for 2 years
19. \$540 at 2.75% for 4 years
20. \$360 at 4.5% for 5 years
21. \$446 at 2.5% for 4 years
22. \$780 at 3.6% for 3 years
23. \$840 at 5.75% for $2\frac{1}{2}$ years
24. \$530 at 7.25% for $1\frac{3}{4}$ years
25. \$1,400 at 6.5% for 2 years
26. \$1,880 at 4.3% for $3\frac{1}{2}$ years
27. \$2,470 at 5.5% for 4 years
28. \$3,200 at 9.75% for $1\frac{1}{2}$ years
29. \$2,810 at 3.95% for $2\frac{1}{4}$ years
30. \$4,340 at 8.12% for $3\frac{1}{4}$ years

6-1

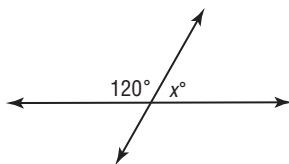
Skills Practice

7MG3.1

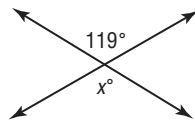
Line and Angle Relationships

Find the value of x in each figure.

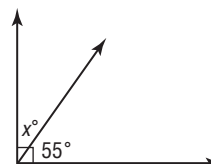
1.



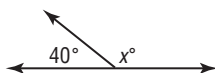
2.



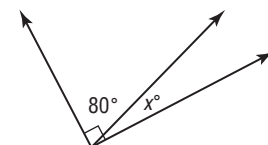
3.



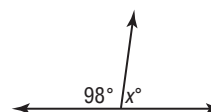
4.



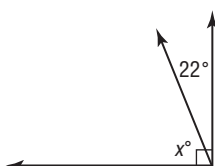
5.



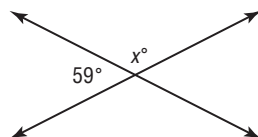
6.



7.



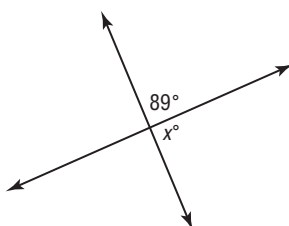
8.



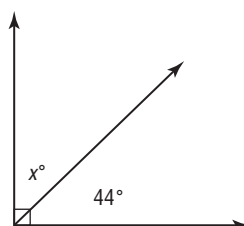
9.



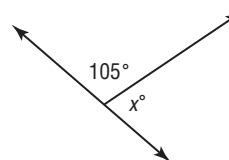
10.



11.



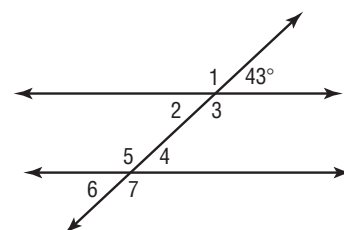
12.



For Exercises 13 and 14, use the figure at the right.

13. Find the measure of angle 2. Explain your reasoning.

14. Find the measure of angle 6. Explain your reasoning.



15. Angles Q and R are complementary.
Find $m\angle R$ if $m\angle Q = 24^\circ$.

16. Find $m\angle J$ if $m\angle K = 29^\circ$ and
 $\angle J$ and $\angle K$ are supplementary.

6-2 Skills Practice

7MRI.2, 7NS1.3

Problem-Solving Investigation: Use Logical Reasoning

For Exercises 1–6, state whether the example uses *deductive* reasoning or *inductive* reasoning.

1. After checking the house numbers on several streets in your neighborhood, you discover that houses that face north always have an odd house number.
2. You determine the type of shape that a sticker is by examining its sides and angles.
3. You use a set of clues about how students received higher or lower scores on a math test as compared with other students to place the students in order from lowest grade to highest grade.
4. You roll a number cube 1,000 times and discover that it lands on the number 4 twice as many times as the number 1.
5. You find a way to use 2 larger containers to measure out the exact amount for a smaller container.
6. You determine what types of shapes will be created by connecting the corners of a regular hexagon.

For Exercises 7–10, solve each problem using logical reasoning.

7. Use a 5-liter container and a 3-liter container to measure out 4 liters of water into a third container.
8. How can you create two right triangles and an isosceles trapezoid by drawing two straight lines through a square?
9. How can you arrange four squares with 6-inch sides to create a figure with a perimeter of 48 inches?
10. Use a 7-inch-long craft stick and a 4-inch-long eraser to draw a 10-inch line.

6-3**Skills Practice**

7MR3.3, 7AF1.1

Polygons**Find the sum of the measures of the interior angles of each polygon.**

1. 13-gon
2. 17-gon
3. 18-gon
4. 24-gon
5. 32-gon
6. 35-gon
7. 21-gon
8. 29-gon
9. 54-gon
10. 64-gon
11. 81-gon
12. 150-gon

**Find the measure of one interior angle of the given regular polygon.
Round to the nearest hundredth if necessary.**

13. heptagon (7-sided)
14. 26-gon
15. decagon (10-sided)
16. 23-gon
17. 37-gon
18. 51-gon
19. 48-gon
20. 85-gon
21. 72-gon
22. 49-gon
23. 66-gon
24. 500-gon

6-4

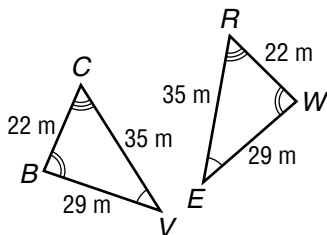
Skills Practice

7MG3.4

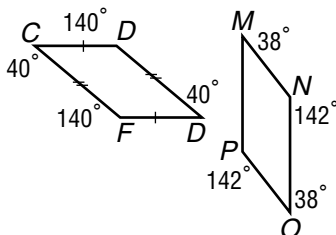
Congruent Polygons

Determine whether the polygons shown are congruent. If so, name the corresponding parts and write a congruence statement.

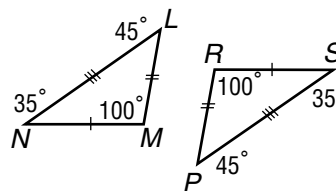
1.



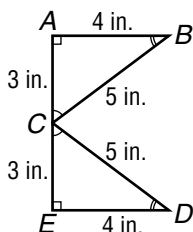
2.



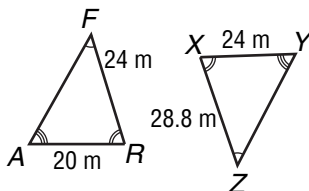
3.



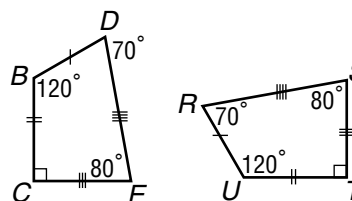
4.



5.



6.



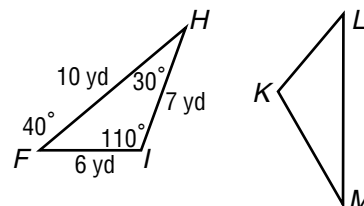
In the figure, $\triangle HFI \cong \triangle MLK$. Find each measure.

7. $m\angle M$

8. ML

9. $m\angle K$

10. KM



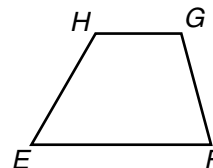
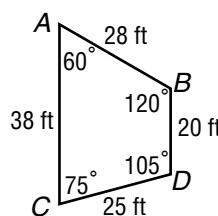
In the figure, quadrilateral $ACDB \cong$ quadrilateral $EFGH$. Find each measure.

11. $m\angle H$

12. EF

13. $m\angle F$

14. HG



6-5

Skills Practice

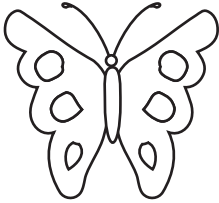
7MG3.2

Symmetry

For Exercises 1–12, complete parts a and b for each figure.

- a. Determine whether the figure has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.
- b. Determine whether the figure has rotational symmetry. Write *yes* or *no*. If *yes*, name its angles of rotation.

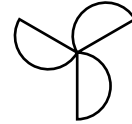
1.



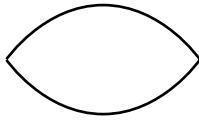
2.



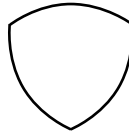
3.



4.



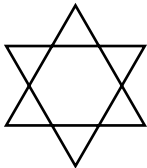
5.



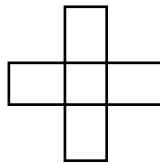
6.



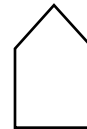
7.



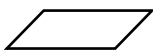
8.



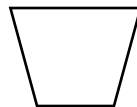
9.



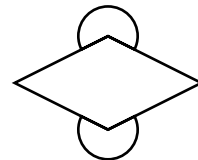
10.



11.



12.



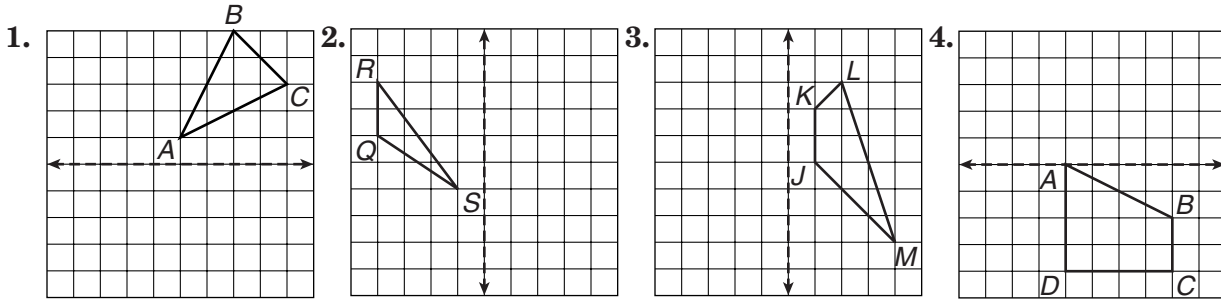
6-6

Skills Practice

7MG3.2

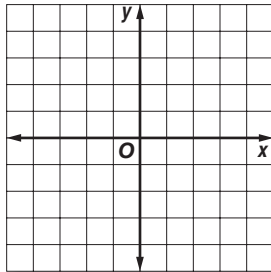
Reflections

Draw the image of the figure after a reflection over the given line.

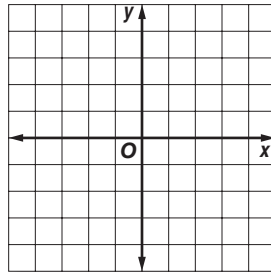


Graph the figure with the given vertices. Then graph the image of the figure after a reflection over the given axis and write the coordinates of its vertices.

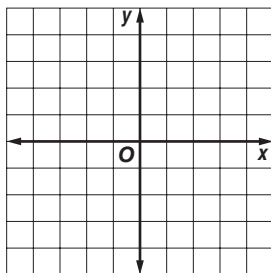
5. triangle ABC with vertices $A(1, 4)$, $B(4, 1)$, and $C(2, 5)$; x -axis



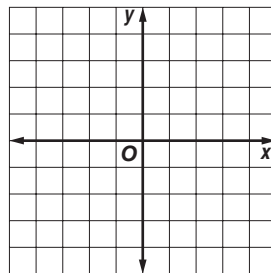
6. triangle DEF with vertices $D(-1, 2)$, $E(-3, 1)$, and $F(-4, 5)$; y -axis



7. trapezoid $WXYZ$ with vertices $W(2, 4)$, $X(2, -2)$, $Y(4, -1)$, and $Z(4, 3)$; y -axis



8. rhombus $QRST$ with vertices $Q(-1, 5)$, $R(-4, 3)$, $S(-1, 1)$, and $T(2, 3)$; x -axis



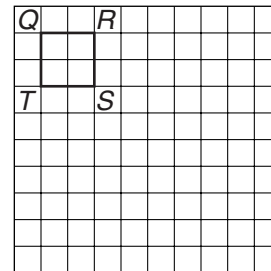
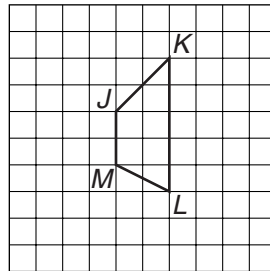
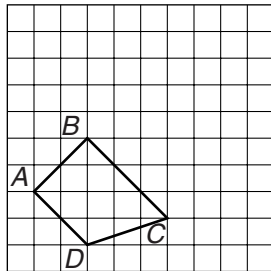
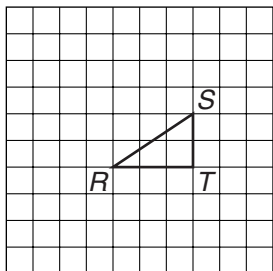
6-7 Skills Practice

7MG3.2

Translations

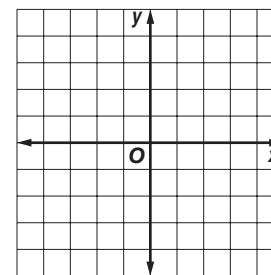
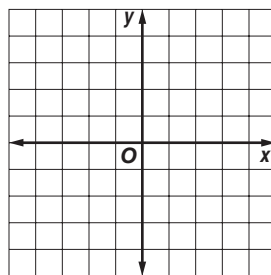
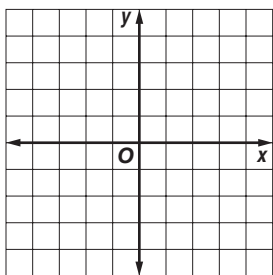
Draw the image of the figure after the indicated translation.

1. 2 units left and 3 units up 2. 4 units right and 1 unit up 3. 1 unit left and 2 units down 4. 5 units right and 3 units down

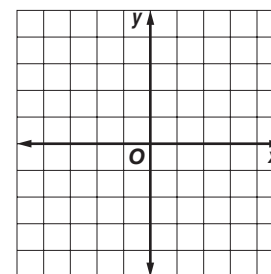
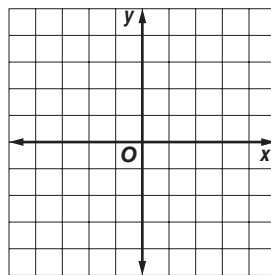
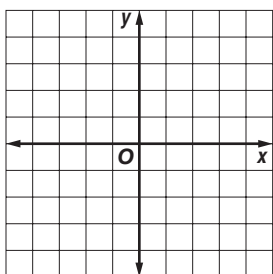


Graph the figure with the given vertices. Then graph the image of the figure after the indicated translation and write the coordinates of its vertices.

5. triangle ABC with vertices $A(-3, -1)$, $B(-4, -4)$, and $C(-1, -2)$ translated 4 units right and 1 unit up
6. triangle XYZ with vertices $X(1, -2)$, $Y(3, -5)$, and $Z(4, 1)$ translated 5 units left and 3 units up
7. triangle EFG with vertices $E(1, 4)$, $F(-1, 1)$, and $G(2, -1)$ translated 3 units left and 1 unit down



8. rhombus $WXYZ$ with vertices $W(-4, 3)$, $X(-1, 1)$, $Y(2, 3)$, and $Z(-1, 5)$ translated 2 units right and 5 units down
9. rectangle $QRST$ with vertices $Q(-2, -4)$, $R(-2, 1)$, $S(-4, 1)$, and $T(-4, -4)$ translated 3 units right and 3 units up
10. trapezoid $BCDE$ with vertices $B(2, -1)$, $C(3, -3)$, $D(-3, -3)$, and $E(0, -1)$ translated 1 unit left and 4 units up

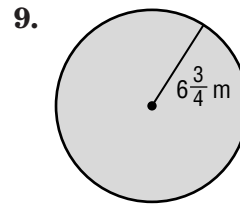
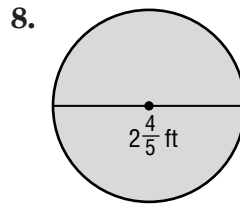
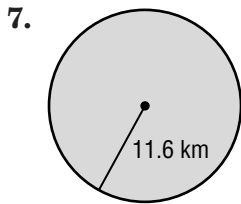
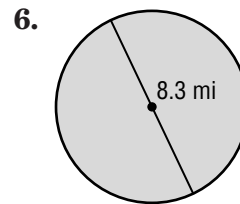
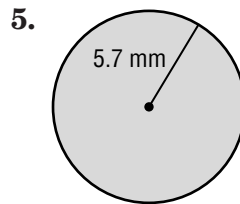
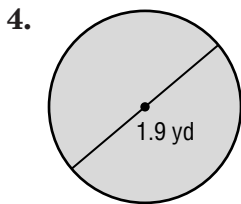
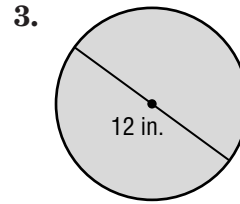
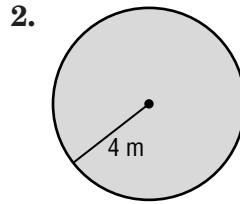
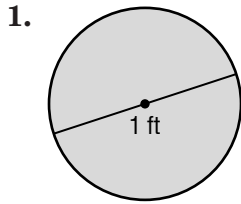


7-1**Skills Practice**

7MG2.1, 7MG3.1

Circumference and Area of Circles

Find the circumference and area of each circle. Use 3.14 for π . Round to the nearest tenth.



10. The diameter is 7.7 feet.

11. The radius is 9.6 millimeters.

12. The radius is 3.8 meters.

13. The diameter is 17.4 yards.

14. The radius is 11.3 centimeters.

15. The diameter is $4\frac{3}{4}$ miles.

16. The radius is $2\frac{1}{3}$ inches.

17. The diameter is $7\frac{5}{8}$ feet.

18. The radius is 5.25 meters.

19. The diameter is $12\frac{3}{4}$ yards.

Problem-Solving Investigation: Solve a Simpler Problem

For Exercises 1–3, rewrite the problem as a simpler problem.

1. Jerry has a square-shaped deep-dish pizza. What is the maximum number of pieces that can be made by using 6 cuts?
2. CDs come in packages of 25 and CD cases come in packages of 16. How many of each type of package will Lilly need to buy in order to make print 400 CDs and put them in cases with none left of either?
3. A restaurant has 10 triangular tables that can be pushed together in an alternating up-and-down pattern as shown below to form one long table for large parties. Each triangular table can seat 3 people per side. How many people can be seated at the combined tables?



For Exercises 4–15, rewrite to solve a simpler problem and solve.
Find a reasonable answer.

4. 13×29

5. $48 + 32 + 87$

6. $74 \times (18 - 9)$

7. $33 \div 9$

8. $\frac{57}{113}$

9. $55 + 44 + 33$

10. 63×17

11. $532 - 389$

12. $78 \times 41 - 276$

13. $52 + 39 + 111$

14. $452 - 377$

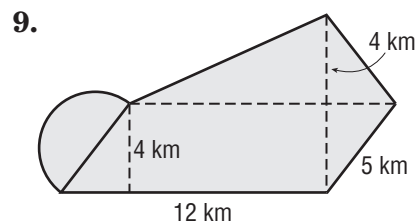
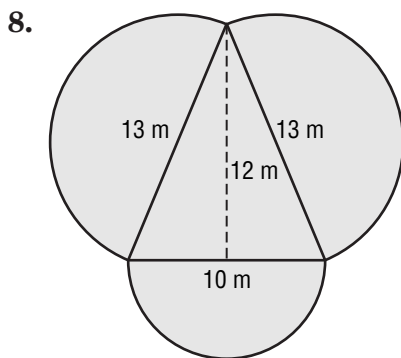
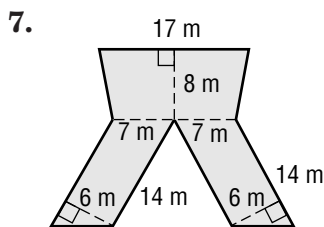
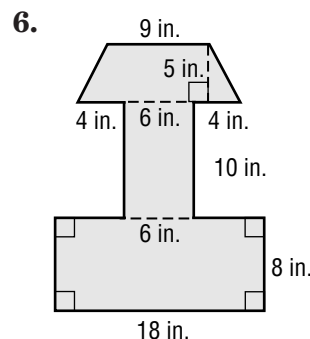
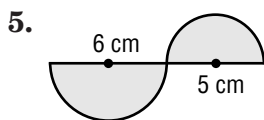
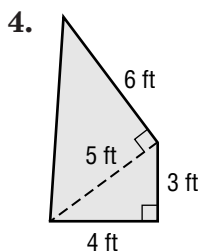
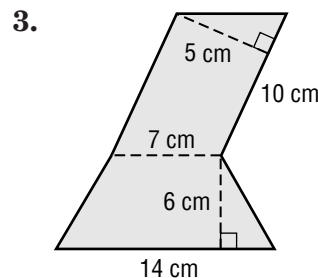
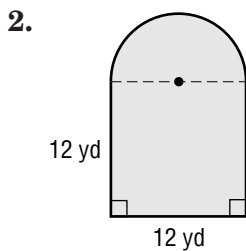
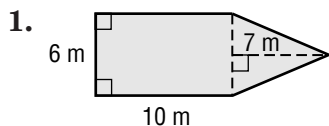
15. $67 \times 34 \times 12$

7-3 Skills Practice

7MG2.1, 7MG2.2

Area of Complex Figures

Find the area of each figure. Round to the nearest tenth if necessary.



10. What is the area of a figure formed using a semicircle with a diameter of 16 feet and a trapezoid with a height of 8 feet and bases of 12 feet and 14 feet?

11. What is the area of a figure formed using a rectangle with a length of 13 kilometers and a width of 7 kilometers and a triangle with a base of 14 kilometers and a height of 11 kilometers?

7-4

Skills Practice

7MG3.6

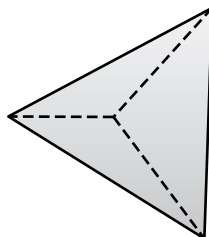
Three-Dimensional Figures

Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.

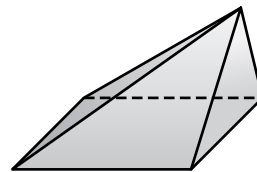
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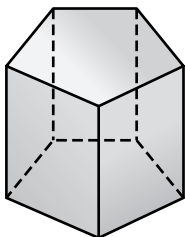
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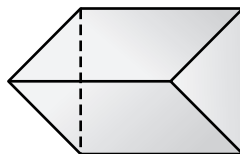
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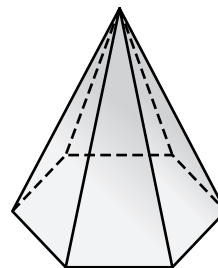
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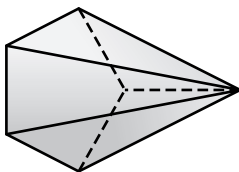
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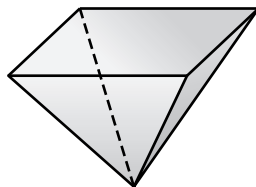
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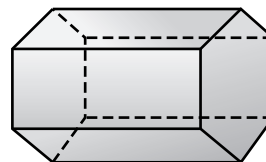
7.



8.



9.

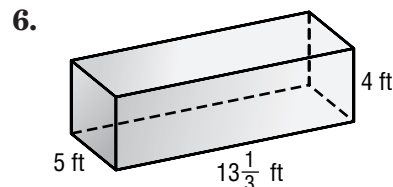
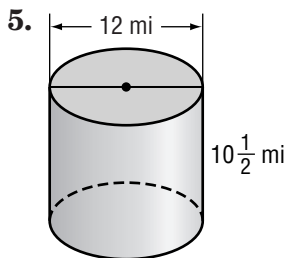
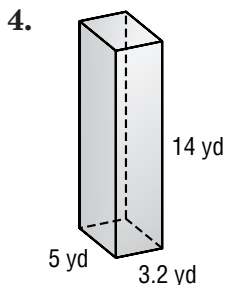
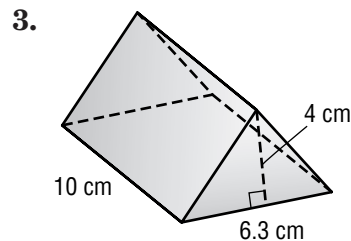
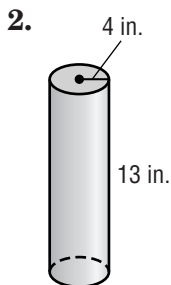
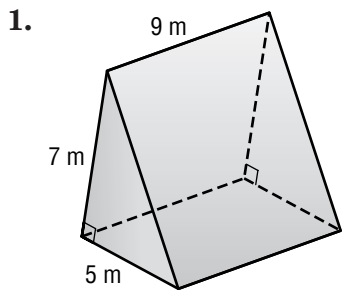


7-5 Skills Practice

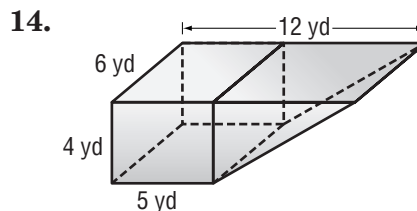
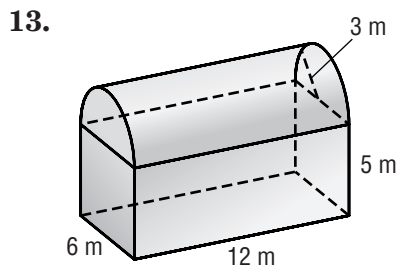
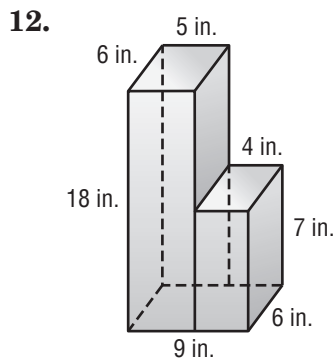
7MG2.1, 7MG2.2

Volume of Prisms and Cylinders

Find the volume of each solid. Use 3.14 for π . Round to the nearest tenth if necessary.



7. rectangular prism: length, 6 in.; width, 4 in.; height, 13 in.
8. triangular prism: base of triangle, 9 cm; altitude 1 cm; height of prism, 15 cm
9. rectangular prism: length, 3.6 mm; width, 4 mm; height, 15.5 mm
10. triangular prism: base of triangle, 6 yd; altitude 5.9 yd; height of prism, 12 yd
11. cylinder: diameter, 8 m; height, 16.2 m



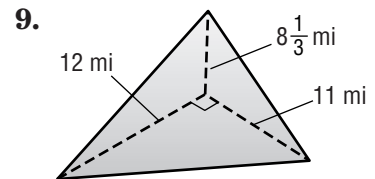
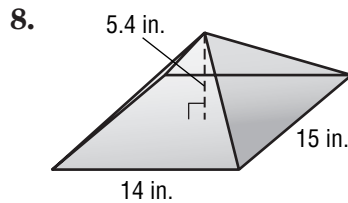
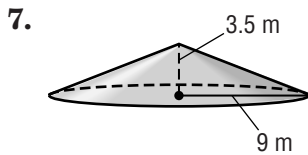
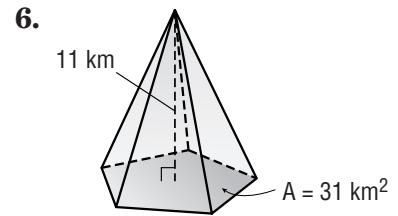
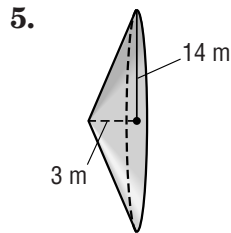
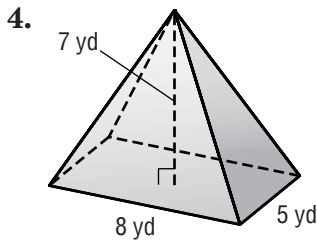
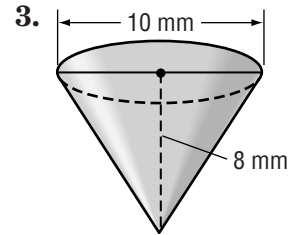
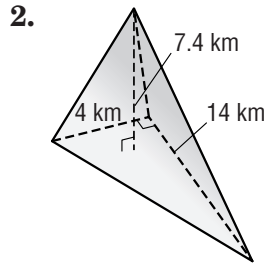
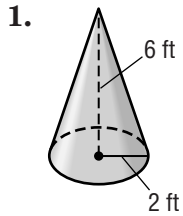
7-6

Skills Practice

7MG2.1

Volume of Pyramids and Cones

Find the volume of each solid. Use 3.14 for π . Round to the nearest tenth if necessary.



10. cone: diameter, 10 cm; height, 12 cm

11. triangular pyramid: triangle base, 20 mm; triangle height, 22 mm; pyramid height, 14 mm

12. triangular pyramid: triangle base, 19 in.; triangle height, 21 in.; pyramid height, 9 in.

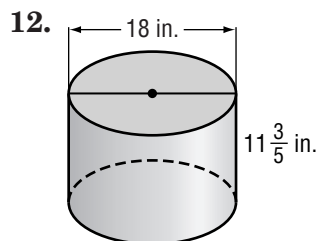
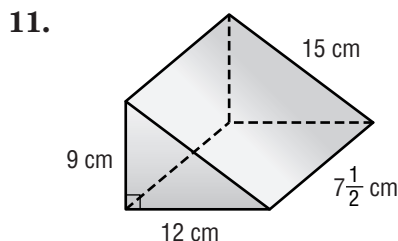
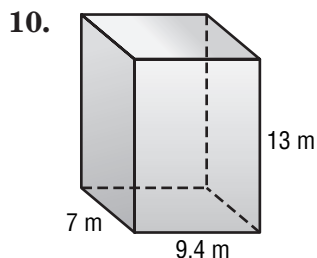
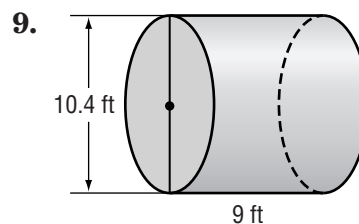
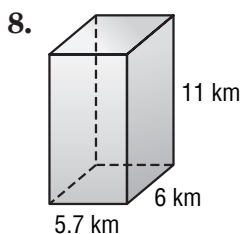
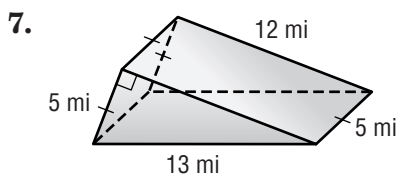
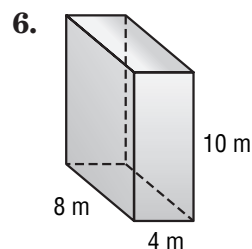
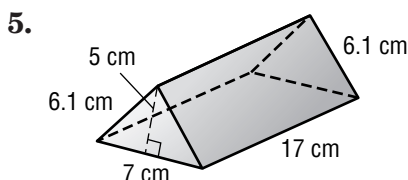
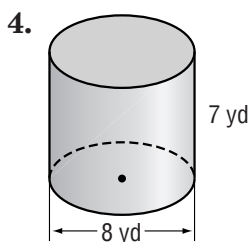
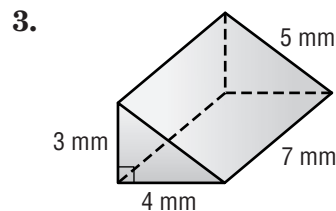
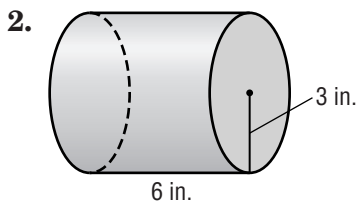
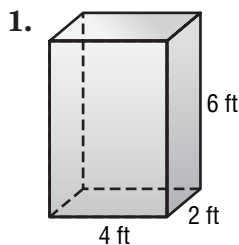
13. cone: radius, 9.7 ft; height, 18 ft

7-7 Skills Practice

7MG2.1, 7MG3.5

Surface Area of Prisms and Cylinders

Find the lateral and total surface areas of each solid. Use 3.14 for π . Round to the nearest tenth if necessary.



13. cube: edge length, 11 m

14. rectangular prism: length, 9 cm; width, 13 cm; height, 18.4 cm

15. cylinder: radius, 9.4 mm; height, 15 mm

16. cylinder: diameter, 28 in.; height, 12.6 in.

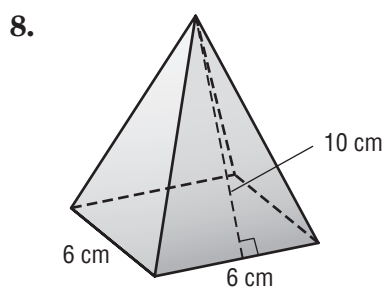
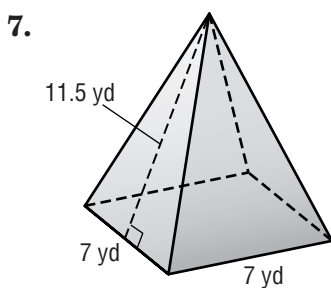
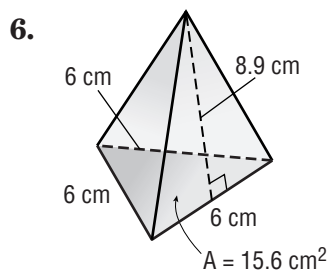
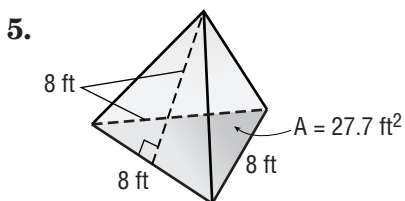
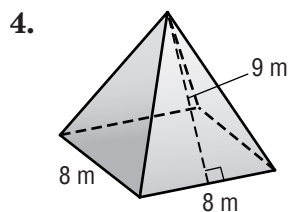
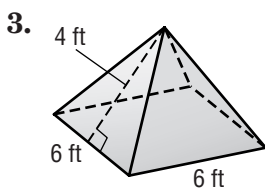
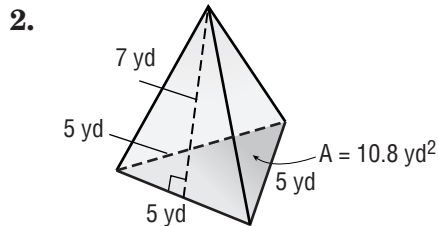
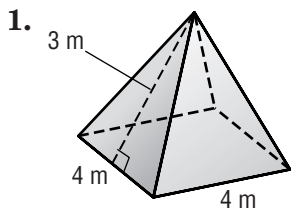
7-8

Skills Practice

7MG2.1

Surface Area of Pyramids

Find the surface area of each solid. Round to the nearest tenth if necessary.



9. square pyramid: base side length, 4 cm; slant height, 7.3 cm

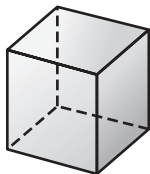
10. square pyramid: base side length, 5 yd; slant height, 12.7 yd

Similar Solids

For Exercises 1–4, each pair of solids is similar. Find the volume of solid B.

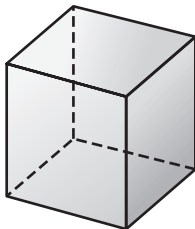
1. solid A

$V = 8 \text{ units}^3$



scale factor = 1.5

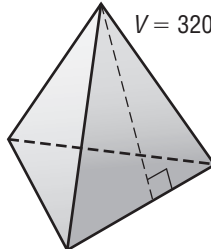
solid B



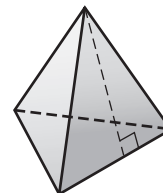
2.

solid A

$V = 320 \text{ units}^3$

scale factor = $\frac{1}{2}$

solid B



3. solid A



scale factor = 2

$V = 4\pi \text{ cubic units}^3$

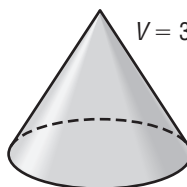
solid B



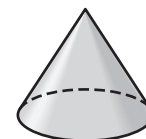
4.

solid A

$V = 324\pi \text{ units}^3$

scale factor = $\frac{2}{3}$

solid B



For Exercises 5–12, find the measure of x . All pairs of figures are similar.

5. square pyramid A: base side = 6 in., slant height = 21 in.
square pyramid B: base side = x in., slant height = 7 in.
6. cone A: base radius = 8 cm, slant height = 20 cm
cone B: base radius = x cm, slant height = 15 cm
7. prism A: length = 14 ft, width = 12 ft, height = 6 ft
prism B: length = 3.5 ft, width = 3 ft, height = x ft
8. regular triangle pyramid A: base side = 3 in., slant height = 10 in.
regular triangle pyramid B: base side = x in., slant height = 25 in.
9. cylinder A: base radius = 13 cm, length = 8 cm
cylinder B: base radius = x cm, length = 24 cm
10. prism A: length = 7 ft, width = 15 ft, height = 8 ft
prism B: length = 21 ft, width = x ft, height = 24 ft
11. square pyramid A: base side = 5 in., slant height = 18 in.
square pyramid B: base side = x in., slant height = 9 in.
12. cone A: base radius = 16 m, height = 28 m
cone B: base radius = x m, height = 21 m

8-1**Skills Practice**

7AF1.1, 7AF1.3, 7AF1.4

Simplifying Algebraic Expressions**Use the Distributive Property to rewrite each expression.**

1. $4(j + 4)$

2. $5(n + 2)$

3. $(c + 9)3$

4. $2(w - 8)$

5. $(s - 7)7$

6. $-4(e + 6)$

7. $(b + 3)(-7)$

8. $-8(v - 7)$

9. $(2n + 3)6$

10. $5(c + d)$

11. $-7(3x - 1)$

12. $(e - f)3$

13. $2(-3m + 1)$

14. $(2b - 3)(-9)$

15. $-5(s + 7)$

16. $(t + 7)3$

17. $6(-2v + 4)$

18. $(m - n)(-3)$

Identify the terms, like terms, coefficients, and constants in each expression.

19. $4e + 7e + 5$

20. $5 - 4x - 8$

21. $-3h - 2h + 6h + 9$

22. $7 - 5y + 2 + 1$

23. $9k + 7 - k + 4$

24. $4z + 3 - 2z - z$

Simplify each expression.

25. $3t + 6t$

26. $4r + r$

27. $7f - 2f$

28. $9a - 8a$

29. $5c + 8c$

30. $2g - 5g$

31. $8k + 3 + 4k$

32. $7m - 5m - 6$

33. $9 - 6x + 5$

34. $7p - 1 - 9p + 5$

35. $-b - 3b + 8b + 4$

36. $5h - 6 - 8 + 7h$

37. $8b + 6 - 8b + 1$

38. $t - 5 - 2t + 5$

39. $4w - 5w + w$

40. $6m - 7 + 2m + 7$

41. $5f - 7f + f$

42. $12y - 8 + 4y + y$

43. $9a + 5 - 7a - 2a$

44. $6g - 7g + 13$

45. $7x + 6 - 9x - 3$

8-2**Skills Practice**

7AF4.1

Solving Two-Step Equations**Solve each equation. Check your solution.**

1. $3n + 4 = 7$

2. $9 = 2s + 1$

3. $4c - 6 = 2$

4. $-4 = 2t - 2$

5. $3f - 12 = -3$

6. $8 = 4v + 12$

7. $5d - 6 = 9$

8. $2k + 12 = -4$

9. $-5 = 3m - 14$

10. $0 = 8z + 8$

11. $9a - 2 = -2$

12. $-8 + 4s = -16$

13. $-1 = 4 - 5x$

14. $5 = 9 - 2x$

15. $-2x + 12 = 14$

16. $1 - x = 8$

17. $-2 = -x + 4$

18. $11 = 2 - 3x$

19. $12 - 3x = 6$

20. $-6x + 5 = 17$

21. $13 = 18 - 5x$

22. $4x + 2x + 2 = 26$

23. $-18 = 9y - 5y + 10$

24. $-24 = 6a - 15 - 5a$

25. $3z - 17 + 2z = 13$

26. $22 = 4 + 8e - 2e$

27. $-15 = 9r + 1 - 7r$

28. $8k - 8 + k = 10$

29. $-27 = 2c - 7 - 6c$

30. $11 = 18 + 3f + 4f$

8-3**Skills Practice**

7AF1.1

Writing Two-Step Equations**Translate each sentence into an equation. Then find each number.**

1. Four more than twice a number is 8.
2. Three more than four times a number is 15.
3. Five less than twice a number is 7.
4. One less than four times a number is 11.
5. Seven more than the quotient of a number and 2 is 10.
6. Six less than six times a number is 12.
7. Five less than the quotient of a number and 3 is -7 .
8. Seven more than twice a number is 1.
9. The difference between 5 times a number and 3 is 12.
10. Nine more than three times a number is -6 .
11. Nine more than the quotient of a number and 4 is 12.
12. Four less than the quotient of a number and 3 is -10 .
13. Nine less than six times a number is -15 .
14. Three less than the quotient of a number and 6 is 1.
15. Eight more than the quotient of a number and 5 is 3.
16. The difference between twice a number and 11 is -23 .

8-4 Skills Practice

7AF1.1, 7AF4.1

Solving Equations with Variables on Each Side

Solve each equation. Check your solution.

1. $3w + 6 = 4w$

2. $a + 18 = 7a$

3. $8c = 5c + 21$

4. $11d + 10 = 6d$

5. $2e = 4e - 16$

6. $7v = 2v - 20$

7. $4n - 6 = 10n$

8. $2y + 27 = 5y$

9. $8h = 6h - 14$

10. $18 - 2g = 4g$

11. $4x - 9 = 6x - 13$

12. $5c - 15 = 2c + 6$

13. $t + 10 = 7t - 14$

14. $8z + 6 = 7z + 4$

15. $2e - 12 = 7e + 8$

16. $9k + 6 = 8k + 13$

17. $2d + 10 = 6d - 10$

18. $-2a - 9 = 6a + 15$

19. $8 - 3k = 3k + 2$

20. $7t - 4 = 10t + 14$

21. $3c - 15 = 17 - c$

22. $14 + 3n = 5n - 6$

23. $3y + 5.2 = 2 - 5y$

24. $10b - 2 = 7b - 7.4$

25. $2m - 2 = 6m - 4$

26. $3g + 5 = 7g + 4$

27. $4s - 1 = 8 - 2s$

28. $9w + 3 = 4w - 9$

29. $6z - 7 = 2z - 2$

30. $3 - a = 4a + 12$

8-5**Skills Practice**

7MR2.8, 7AF1.1

Problem-Solving Investigation: Guess and Check

Use the guess and check strategy to solve each problem.

- 1. NUMBER THEORY** A number cubed is 1,728. What is the number?
- 2. MONEY** Jackson has exactly \$43 in \$1, \$5, and \$10 bills. If he has 8 bills, how many of each bill does he have?
- 3. NUMBERS** Jona is thinking of two numbers. One number is 18 more than twice the other number. The sum of the numbers is 48. What two numbers is Jona thinking of?
- 4. PACKAGES** The packages in a mail driver's truck weigh a total of 950 pounds. The large packages weigh 20 pounds each and the small packages weigh 10 pounds each. If he has 10 more large packages than small packages, how many large and small packages are on the truck?
- 5. NUMBER THEORY** One number is twice the other. The sum of the numbers is 246. What are the two numbers?
- 6. MOVIE RENTALS** A movie rental store rented 3 times as many DVDs as videos. DVDs rent for \$5 a day and videos rent for \$3 a day. If the total rental income for a weekend was \$2,160, how many DVDs and videos did the store rent?

8-6**Skills Practice**

7AF1.1

Inequalities**Write an inequality for each sentence.**

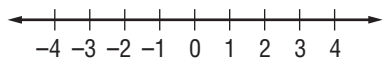
- SPORTS** You need to score at least 30 points to take the lead.
- SEASONS** There are less than 12 hours of daylight each day in winter.
- TRAVEL** The bus seats at most 60 people.
- MONEY** The coupon is good for any item that costs less than \$10.
- TESTS** A score of at least 92 on the test is considered an A.
- HEALTH** The baby weighed more than 7 pounds at birth.
- DRIVING** Victor drives less than 12,000 miles per year.
- TRAVEL** Your waiting time will be 18 minutes or less.
- SCHOOL TRIPS** At least 15 students must sign up for the school trip.

For the given value, state whether each inequality is *true* or *false*.

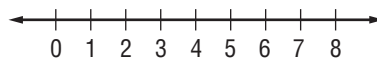
- | | |
|---------------------------------|----------------------------------|
| 10. $y + 2 < 8, y = 3$ | 11. $12 > u - 1, u = 14$ |
| 12. $p + 5 \geq -6, p = 1$ | 13. $-6 < a - 3, a = -1$ |
| 14. $4s \leq 15, s = 4$ | 15. $-5 > 1 - d, d = -9$ |
| 16. $-2 - g \geq -7, g = 5$ | 17. $\frac{k}{3} > 4, k = 12$ |
| 18. $4 < \frac{-10}{z}, z = -2$ | 19. $\frac{12}{m} \geq 3, m = 4$ |

Graph each inequality on a number line.

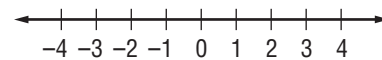
20. $v \geq 3$



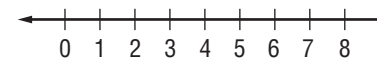
21. $b > 5$



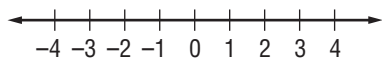
22. $n \leq -3$



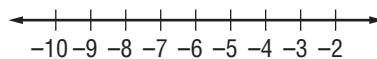
23. $w < 4$



24. $r > -1$



25. $h \geq -7$



8-7**Skills Practice**

7AF1.1, 7AF4.1

Solving Inequalities by Adding or Subtracting**Solve each inequality. Check your solution.**

1. $r + 5 < 6$

2. $e - 3 > 2$

3. $-8 \geq k - 5$

4. $y + 6 > 5$

5. $n - 4 \geq 6$

6. $-4 > g - 10$

7. $-1 \leq m + 8$

8. $t + 1 \leq 6$

9. $-17 > u - 2$

10. $5 + x \leq -7$

11. $10 > p + 9$

12. $-4 + z < -12$

13. $5 \leq q + 8$

14. $k - 6 > 2$

15. $s + 7 \leq -13$

Write an inequality and solve each problem.

16. Two more than a number is less than eleven.

17. Five less than a number is at least -2 .

18. The difference between a number and 6 is no more than 5.

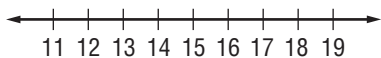
19. The sum of a number and 7 is more than 1.

20. The difference between a number and ten is greater than 9.

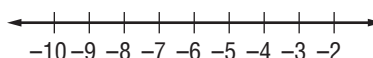
21. Four less than a number is less than 11.

Solve each inequality and check your solution. Then graph the solution on a number line.

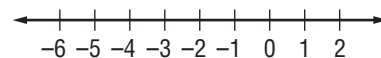
22. $9 < p - 6$



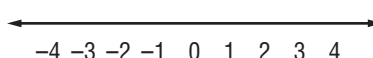
23. $w + 4 \geq -3$



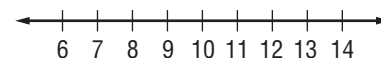
24. $1 > z + 5$



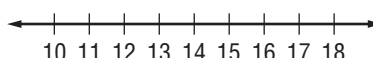
25. $-6 \leq s - 7$



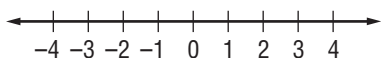
26. $b - 3 \leq 7$



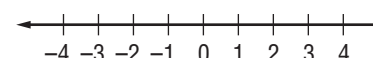
27. $v + 9 > 23$



28. $4 + v \geq 5$



29. $m + 7 < 11$



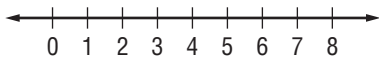
8-8**Skills Practice**

7AF1.1, 7AF4.1

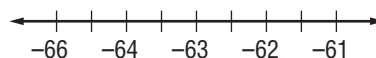
Solving Inequalities by Multiplying or Dividing

Solve each inequality and check your solution. Then graph the solution on a number line.

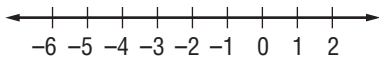
1. $2v > 10$



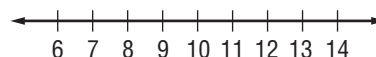
2. $\frac{p}{3} < -21$



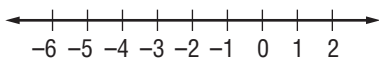
3. $-12 \leq 4g$



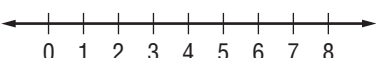
4. $60 \geq 5c$



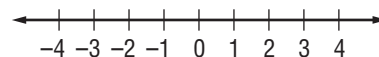
5. $\frac{a}{2} > -2$



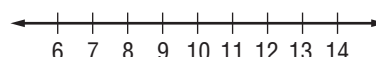
6. $1 \leq \frac{u}{6}$



7. $-14 > 14n$



8. $-4d \geq -28$



Solve each inequality. Check your solution.

9. $3a + 2 < -4$

10. $5b - 4 \geq -29$

11. $\frac{m}{4} + 6 < 10$

12. $-7d + 8 \leq 1$

13. $\frac{z}{-8} - 5 < -2$

14. $2 + \frac{r}{6} > -1$

15. $4v - 6 \leq 2$

16. $3 + \frac{h}{-7} \geq 1$

17. $-2y - 5 \leq 19$

Write an inequality for each sentence. Then solve the inequality.

18. Six times a number is less than 60.

19. The quotient of a number and 2 is more than -11 .

20. The quotient of a number and 5 is at most 25.

21. Two times a number is more than 36.

22. Negative three times a number is at least -60 .23. Four times a number is greater than -56 .

9-1**Skills Practice**

7AF3.3, 7MR2.5

Functions**Find each function value.**

1. $f(2)$ if $f(x) = x + 4$

2. $f(9)$ if $f(x) = x - 8$

3. $f(3)$ if $f(x) = 2x + 2$

4. $f(6)$ if $f(x) = 2x - 5$

5. $f(-7)$ if $f(x) = 3x + 6$

6. $f(8)$ if $f(x) = 3x - 10$

7. $f(-5)$ if $f(x) = 4x + 2$

8. $f(-3)$ if $f(x) = -4x - 4$

9. $f(-4)$ if $f(x) = -5x - 3$

Complete each function table.

10. $f(x) = x + 7$

x	$x + 7$	$f(x)$
-1		
0		
1		
2		

11. $f(x) = x - 13$

x	$x - 13$	$f(x)$
-2		
-1		
2		
3		

12. $f(x) = 2x + 8$

x	$2x + 8$	$f(x)$
-3		
-1		
0		
4		

13. $f(x) = 2x - 3$

x	$2x - 3$	$f(x)$
-2		
2		
5		
8		

14. $f(x) = 3x + 4$

x	$3x + 4$	$f(x)$
-4		
-2		
1		
3		

15. $f(x) = 7 - 3x$

x	$7 - 3x$	$f(x)$
-3		
-1		
3		
5		

16. $f(x) = 4x + 5$

x	$4x + 5$	$f(x)$
-4		
-1		
2		
6		

17. $f(x) = 1 - 4x$

x	$1 - 4x$	$f(x)$
-2		
0		
3		
5		

18. $f(x) = 6x - 2$

x	$6x - 2$	$f(x)$
-5		
-3		
2		
7		

9-2

Skills Practice

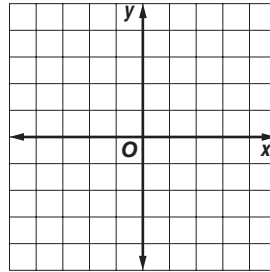
7AF1.5

Representing Linear Functions

Complete the function table. Then graph the function.

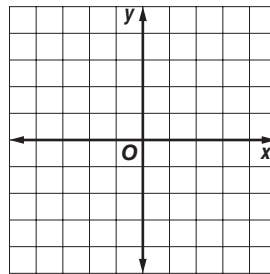
1. $y = x + 4$

x	$x + 4$	y	(x, y)
-2			
-1			
0			
1			



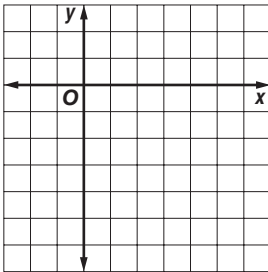
2. $y = 2x - 1$

x	$2x - 1$	y	(x, y)
-1			
0			
1			
2			

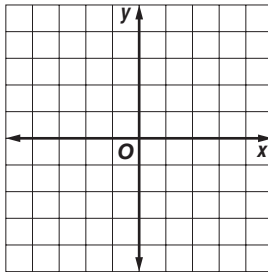


Graph each function.

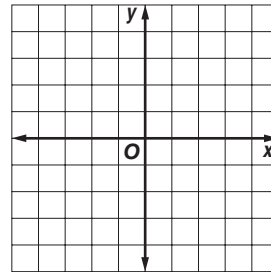
3. $y = x - 6$



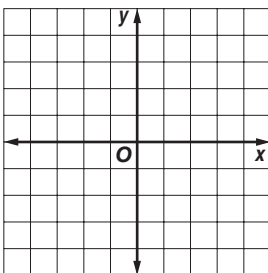
4. $y = 2x - 3$



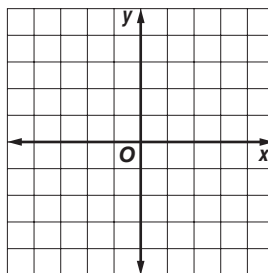
5. $y = 1 - x$



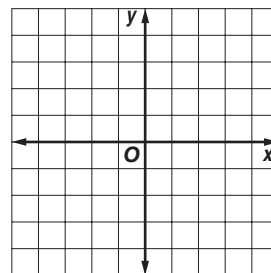
6. $y = 3x + 2$



7. $y = \frac{x}{2} + 2$



8. $y = \frac{x}{3} - 1$



9-3**Skills Practice****7AF3.3****Slope****Find the slope of the line that passes through each pair of points.**

1. $A(-2, -4), B(2, 4)$

2. $C(0, 2), D(-2, 0)$

3. $E(3, 4), F(4, -2)$

4. $G(-3, -1), H(-2, -2)$

5. $I(0, 6), J(-1, 1)$

6. $K(0, -2), L(2, 4)$

7. $O(1, -3), P(2, 5)$

8. $Q(1, 0), R(3, 0)$

9. $S(0, 4), T(1, 0)$

10. $U(2, 1), V(3, 4)$

11. $W(2, -2), X(-1, 1)$

12. $Y(-5, 0), Z(-2, -4)$

13. $A(2, -1), B(-4, -4)$

14. $C(-2, 2), D(-4, 2)$

15. $E(-1, -4), F(-3, 0)$

16. $G(7, 4), H(2, 0)$

17. $K(-2, -5), L(3, 3)$

18. $M(-1, -1), N(-4, -5)$

19. $O(5, -3), P(-3, 4)$

20. $Q(-1, -3), R(1, 2)$

21. $W(3, -5), X(1, 1)$

22. $Y(2, 2), Z(-5, -4)$

23. $C(0, -2), D(3, -2)$

24. $G(2, -2), H(4, 2)$

9-4**Skills Practice**

7AF3.4, 7AF4.2

Direct Variation

For Exercises 1–3, determine whether each linear function is a direct variation. If so, state the constant of variation.

1.

Price x	\$5	\$10	\$15	\$20
Tax y	\$0.41	\$0.82	\$1.23	\$1.64

2.

Hours x	11	12	13	14
Distance y (miles)	154	167	180	194

3.

Age x	8	9	10	11
Grade y	3	4	5	6

For Exercises 4–12, y varies directly with x . Write an equation for the direct variation. Then find each value.

- If $y = 8$ when $x = 3$, find y when $x = 45$.
- If $y = -4$ when $x = 10$, find y when $x = 2$.
- If $y = 27$ when $x = 8$, find y when $x = 11$.
- Find y when $x = 12$ if $y = 2$ when $x = 5$.
- Find y when $x = 3$ if $y = -4$ when $x = -9$.
- Find y when $x = -6$ if $y = 15$ when $x = -5$.
- If $y = 20$ when $x = 8$, what is the value of x when $y = -2$?
- If $y = -30$ when $x = 15$, what is the value of x when $y = 60$?
- If $y = 42$ when $x = 15$, what is the value of x when $y = 70$?

9-5

Skills Practice

7AF3.3

Slope-Intercept Form

State the slope and y-intercept of the graph of each equation.

1. $y = x + 4$

2. $y = 2x - 2$

3. $y = 3x - 1$

4. $y = -x + 3$

5. $y = \frac{1}{2}x - 5$

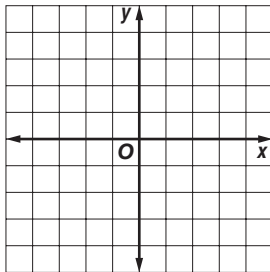
6. $y = -\frac{1}{3}x + 4$

7. $y - 2x = -1$

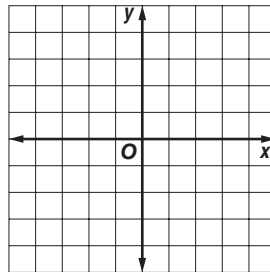
8. $y + 4x = 2$

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

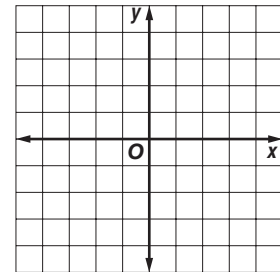
10. Graph a line with a slope of 1 and a y-intercept of -4.



11. Graph a line with a slope of 2 and a y-intercept of -3.

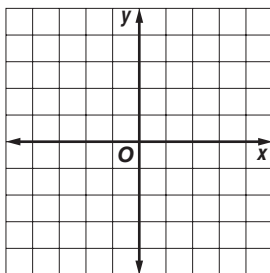


12. Graph a line with a slope of $\frac{1}{3}$ and a y-intercept of 1.

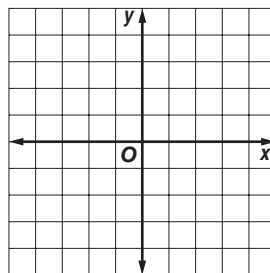


Graph each equation using the slope and y-intercept.

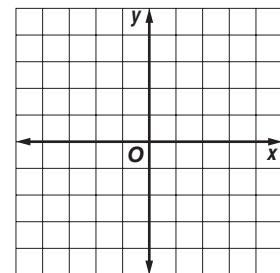
13. $y = 3x - 3$



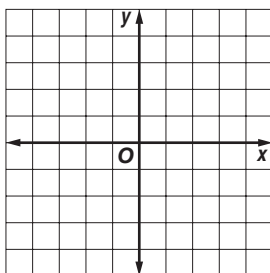
14. $y = -x + 1$



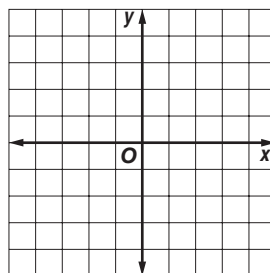
15. $y = \frac{1}{2}x - 2$



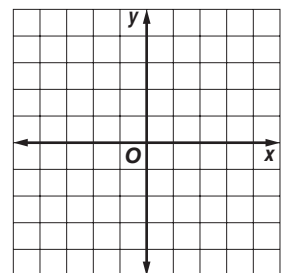
16. $y = 4x - 2$



17. $y = -\frac{3}{2}x + 1$



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



Writing Systems of Equations and Inequalities

Write a system of equations or inequalities to represent each situation. Write the systems in standard form and line up the variables.

1. The middle school has a total of 456 students. There are 54 more seventh graders than eighth graders.
2. Vic is 43 years older than Andre. Their combined age is 71.
3. Marco's bag contains 88 red and black marbles. He has 12 more black marbles than red marbles.
4. There are thirty-three students in the Chess Club. There are five more boys than girls in the club.
5. The Hoyt family and the London family traveled a total of 63,456 miles this year. The Hoyt family traveled 356 miles more than half of what the London family traveled.
6. There are five less than twice as many girls as boys on the soccer team. There are seventeen less than twice as many boys as girls on the soccer team.
7. Haley's mom does not want to spend more than \$50 on balloons and party favors for her birthday party. A dozen balloons cost \$3.59 and a dozen party favors cost \$5.23. She needs at least 6 dozen balloons and no less than 3 dozen party favors.

9-7

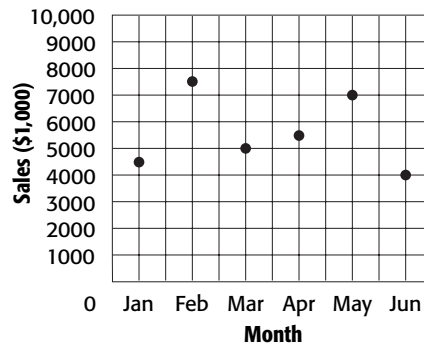
Skills Practice

7MR2.5, 7SDAPI.2

Problem-Solving Investigation: Use a Graph

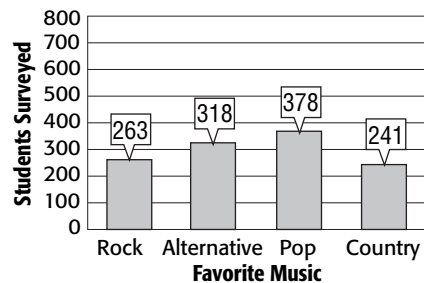
For Exercises 1–3, use the graph at the right. The graph shows the monthly sales for Wilson’s Flower Shop.

1. During which month were sales highest?
2. During which month were sales lowest?
3. Between which two months did sales increase the most?



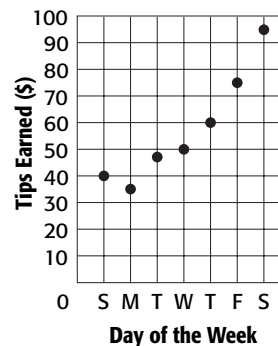
For Exercises 4–8, use the graph at the right. The graph shows the results of a survey of students’ favorite types of music.

4. Which type of music received the most votes?
5. How many more votes did alternative receive than rock?
6. How many total students were surveyed?
7. How many more students voted for pop than country?
8. If the survey were expanded to 6,000 students, about how many would be expected to vote for alternative as their favorite type of music?



For Exercises 9–12, use the graph at the right. Each point on the graph shows the amount in tips that Rachael received and the day that the tips were earned.

9. What was the lowest amount that Rachael was tipped?
10. What was the highest total amount that Rachael was tipped in one day?
11. On which day were Rachael’s tips highest overall?
12. Is the correlation between tips earned and day of the week positive, negative, or none?



Scatter Plots

Explain whether the scatter plot of the data for the following shows a *positive, negative, or no* relationship.

1. rotations of a bicycle tire and distance traveled on the bicycle
2. number of pages printed by an inkjet printer and the amount of ink in the cartridge
3. age of a child and the child's shoe size
4. number of letters in a person's first name and the person's height
5. shots attempted and points made in a basketball game
6. year and winning time in the 100-meter dash in the Olympics
7. diameter of the trunk of a tree and the height of the tree
8. number of a bank account and the amount of money in the bank account
9. length of a taxi ride and the amount of the fare
10. daily high temperature and the amount of clothing a person wears
11. a person's age and a person's street address
12. outside temperature and the cost of air conditioning
13. the age of a car and how many people fit inside of it
14. inches of rainfall in the last 30 days and the water level in a reservoir
15. miles ridden on a bicycle tire and thickness of the tire tread
16. population of a U.S. state and the number of U.S. senators a state has

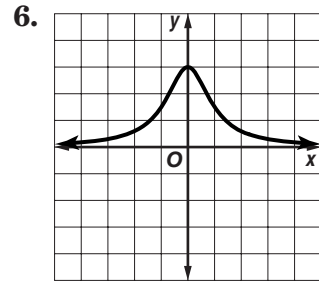
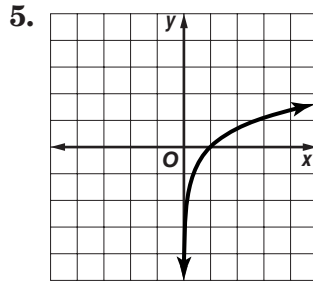
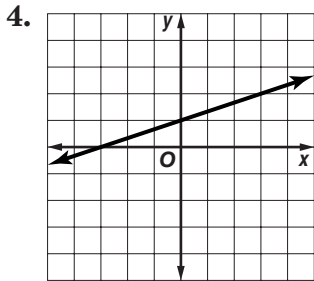
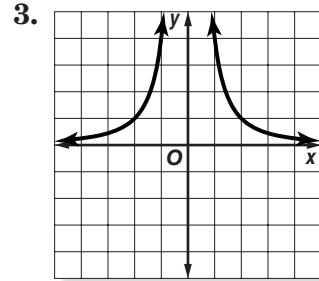
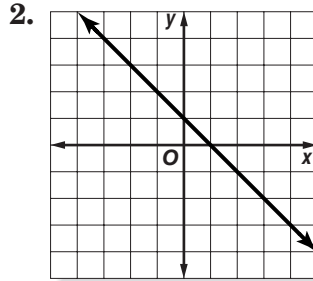
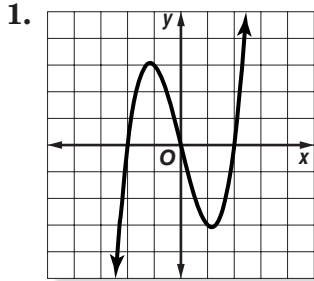
10-1

Skills Practice

AF1.5

Linear and Nonlinear Functions

Determine whether each graph, equation, or table represents a *linear* or *nonlinear* function. Explain.



7. $y = 2x$

8. $y = 3x^2 + 5$

9. $y = \frac{6}{x}$

10. $y = x^3 + 7$

11. $y = -6$

12. $y = -\frac{5x}{2}$

13.

x	1	2	3	4
y	5	7	9	11

14.

x	-2	0	2	4
y	0	1	3	9

15.

x	-1	0	1	2
y	8	4	0	-4

16.

x	2	3	4	5
y	3	5	8	12

17.

x	-2	1	4	7
y	-4	1	6	11

18.

x	3	6	9	12
y	10	6	3	1

10-2

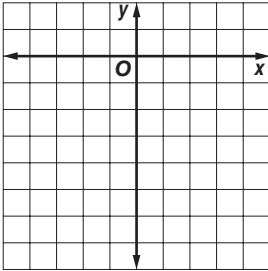
Skills Practice

7AF1.5, 7AF3.1

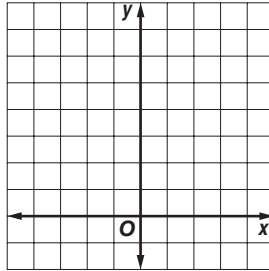
Graphing Quadratic Functions

Graph each function.

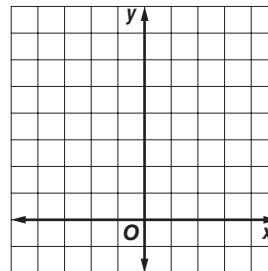
1. $y = -4x^2$



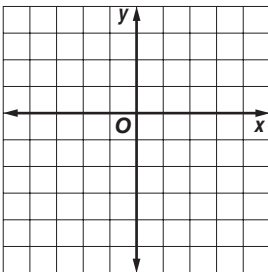
2. $y = 1.5x^2$



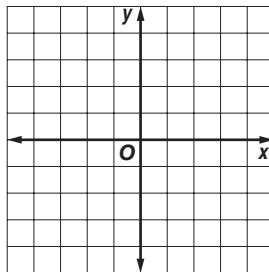
3. $y = x^2 + 4$



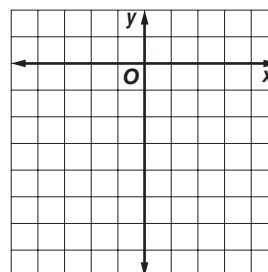
4. $y = x^2 - 5$



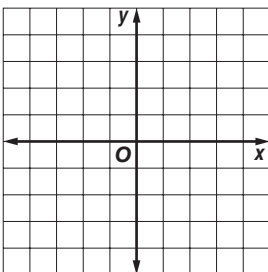
5. $y = -x^2 + 3$



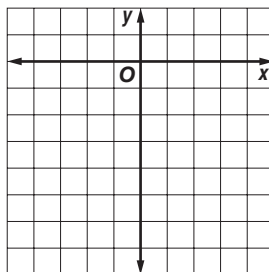
6. $y = -x^2 - 1$



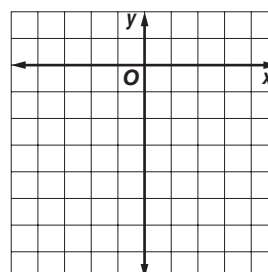
7. $y = 2x^2 - 3$



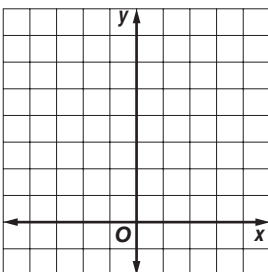
8. $y = -2x^2 + 1$



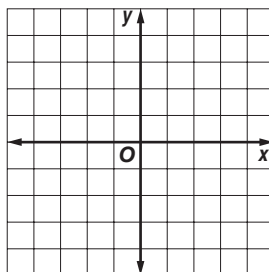
9. $y = -2x^2 - 2$



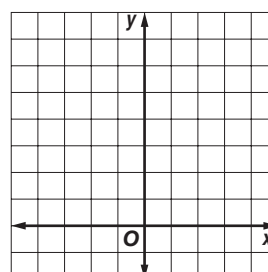
10. $y = 3x^2 + 1$



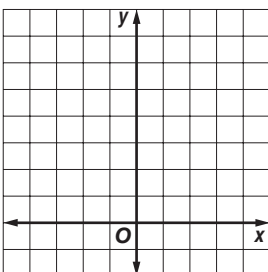
11. $y = -3x^2 + 3$



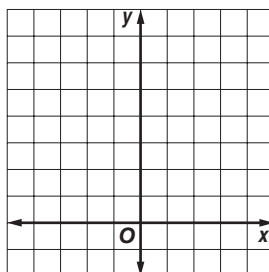
12. $y = 0.5x^2 + 2$



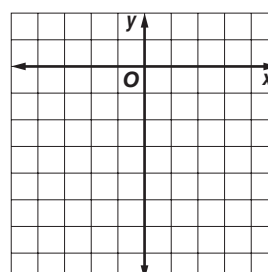
13. $y = 1.5x^2 - 1$



14. $y = 2.5x^2 + 1$



15. $y = -0.5x^2 - 1$



10-3**Skills Practice**

7MR2.5, 7AF1.1

Problem-Solving Investigation: Make a Model**Make a model to solve each problem.**

- 1. SHIPPING** A spice distributor is making boxes in which to pack cylindrical spice containers. The diameter of each container is 2 inches. The height of each container is 4 inches. If they place 4 rows with 3 containers in each row in a box, what is the volume of the box?
- 2. SEWING** Jordan has a bread basket in the shape of a rectangular prism that measures 12 inches high, 18 inches long, and 16 inches wide. She wants to cover the inside of the basket with a 50-inch by 20-inch piece of fabric. Does Jordan have enough fabric to cover the inside of the basket? Explain your answer.
- 3. BEADS** Elsa is making a wooden box for sorting and storing her bead collection. The outer dimensions of the box are 10 inches by 10 inches. She wants to make 100 compartments that are approximately 1-inch squares. How many horizontal and vertical dividers will Elsa need to make the compartments?
- 4. ARRANGING TABLES** Donna is arranging four tables to make seating for her party guests. Standing alone, each table will seat 4 people on each side and 2 people at each end. She can either place the tables end-to-end to make one long table or she can separate the tables into four individual tables. How many more guests can she seat if she separates the tables than if she places them end-to-end?
- 5. MAKING FRAMES** Julian is making picture frames by gluing square tiles onto the wooden sides. The wooden sides measure 8 inches wide by 10 inches long by 1 inch wide. If he glues a 1-inch square tile at every corner and covers the remainder of the wood sides with $\frac{1}{2}$ -inch square tiles, how many of each size tile does Julian need to make 4 frames?

Use any strategy to solve each problem.

- 6. QUIZ SCORES** Mandy answered 10 questions out of 12 correctly on her math quiz. How many questions must she answer correctly to get the same score on a quiz with 30 questions?
- 7. NUMBER THEORY** There are two numbers. One number is 4 less than three times the other number. Find the two numbers.
- 8. GARDENING** Justin helped his dad in the yard 3 times as long as Paula. Paula helped her dad 2 hours less than Carly. Carly helped her dad in the yard 4 hours. How many hours did Justin help his dad?

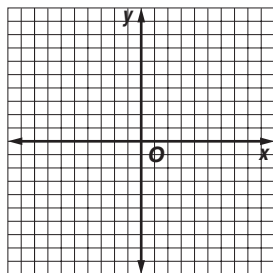
10-4 Skills Practice

7AF3.1, 7AF3.2

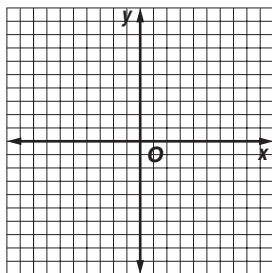
Graphing Cubic Functions

Graph each function.

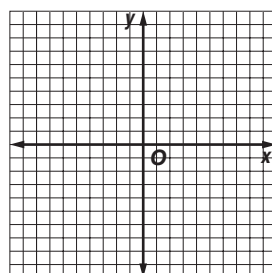
1. $y = 2x^3 + 1$



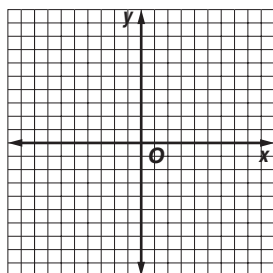
2. $y = -2x^3$



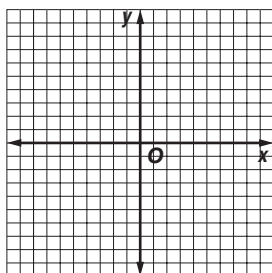
3. $y = x^3 - 2$



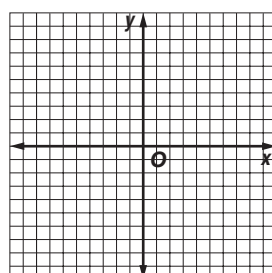
4. $y = -3x^3$



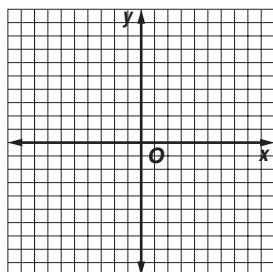
5. $y = -x^3 - 2$



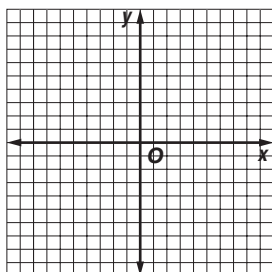
6. $y = 2x^3 - 2$



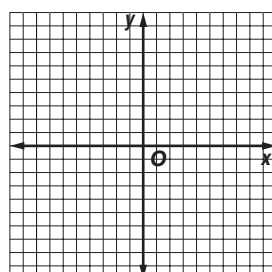
7. $y = x^3 + 3$



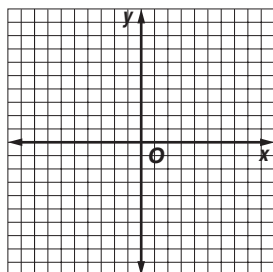
8. $y = -3x^3 - 2$



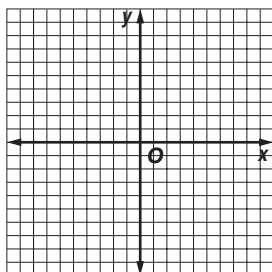
9. $y = -x^3 + 1$



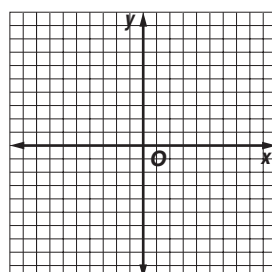
10. $y = -2x^3 + 2$



11. $y = -2x^3 - 2$



12. $y = x^3 + 4$



10-5**Skills Practice**

7NS2.3, 7AF2.1, 7AF2.2

Multiplying Monomials**Multiply. Express using exponents.**

1. $2^7 \cdot 2^2$

2. $4^2 \cdot 4^4$

3. $10^2 \cdot 10^3$

4. $k^8 \cdot k$

5. $t^7 \cdot t^6$

6. $2w^2 \cdot 5w^2$

7. $3e^3 \cdot 7e^3$

8. $4r^4(-4r^3)$

9. $(-6t^7)(5t^2)$

10. $7y^3 \cdot 6y$

11. $(3u^5)(-9u^6)$

12. $(-2p^7)(-8p^3)$

13. $(5c^4)(-7c)$

14. $(8z^7)(3z^6)$

15. $(-3l^2w^3)(2lw^4)$

16. $10c^2 \cdot c^2d^6$

17. $(-11w^4)(-5w^3x^4)$

18. $q^2r^3(3q)$

19. $(8f^6)(-6f^2g^5)$

20. $(10d^2)(-5d^5)$

21. $9k^2(-k^2l^5)$

22. $(-4b^6)(-b^2c^3)$

23. $(10t^4v^5)(3t^2v^5)$

24. $a^4c^6(a^2c)$

10-6**Skills Practice**

7NS2.3, 7AF2.1, 7AF2.2

Dividing Monomials**Multiply or divide. Express using exponents.**

1. $\frac{2^9}{2^3}$

2. $\frac{3^8}{3^4}$

3. $\frac{5^9}{5^2}$

4. $\frac{8^7}{8}$

5. $\frac{b^{12}}{b^5}$

6. $\frac{12n^5}{4n^2}$

7. $\frac{14m^3}{7m^2}$

8. $\frac{9r^8}{3r^4}$

9. $\frac{24t^9}{6t^3}$

10. $\frac{18y^6}{2y}$

11. $a^4c^6(a^2c)$

12. $\frac{15x^8y^4}{3x^5y^2}$

13. $\frac{-21s^6t^3}{3s^2t}$

14. $\frac{34v^7}{2v^3}$

15. $\frac{4^2q^5}{2q^2}$

16. $\frac{5^{10}}{5^2}$

17. $\frac{7^9}{7^6}$

18. $\frac{r^8}{r^7}$

19. $\frac{(-y)^7}{(-y)^2}$

20. $\frac{g^{-12}}{g^8}$

21. $\frac{8^2}{8^{-4}}$

22. $\frac{7^9}{7^6}$

23. $\frac{24x^7}{6x^2}$

24. $\frac{15t^{-2}}{3t}$

10-7**Skills Practice**

7AF2.2

Powers of Monomials**Simplify.**

1. $(7^2)^3$

2. $(3^2)^6$

3. $(8^3)^2$

4. $(9^4)^2$

5. $(d^7)^6$

6. $(m^5)^5$

7. $(h^6)^3$

8. $(z^7)^3$

9. $[(4^3)^2]^2$

10. $(-5a^2b^7)^7$

11. $(2m^5g^{11})^6$

12. $[(2^3)^3]^2$

13. $(7a^5b^6)^4$

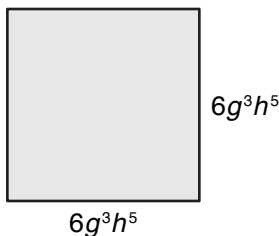
14. $(7m^3n^{11})^5$

15. $(-3w^3z^8)^5$

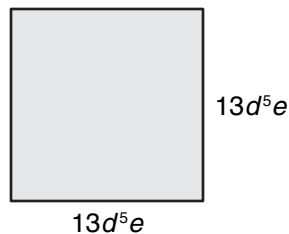
16. $(-7r^4s^{10})^4$

Express the area of each square below as a monomial.

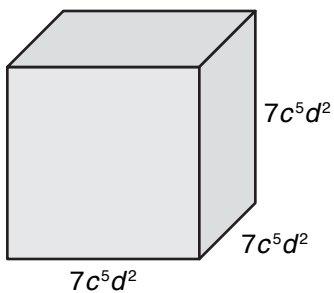
17.



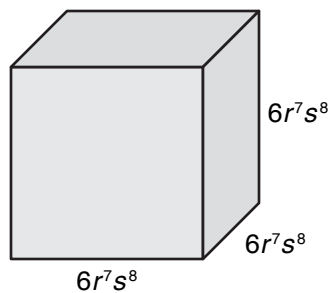
18.



19.



20.



10-8**Skills Practice**

7AF2.2

Roots of Monomials**Simplify.**

1. $\sqrt{m^2}$

2. $\sqrt{x^6}$

3. $\sqrt{p^2r^4}$

4. $\sqrt{a^6b^8}$

5. $\sqrt{16n^4}$

6. $\sqrt{36w^{10}}$

7. $\sqrt{121x^8y^4}$

8. $\sqrt{225a^2b^8}$

9. $\sqrt{400m^6n^{14}}$

10. $\sqrt[3]{c^3}$

11. $\sqrt[3]{t^9}$

12. $\sqrt[3]{f^6g^{15}}$

13. $\sqrt[3]{v^{12}w^{18}}$

14. $\sqrt[3]{27g^{15}}$

15. $\sqrt[3]{8p^{24}}$

16. $\sqrt[3]{64k^{12}m^{18}}$

17. $\sqrt[3]{125x^3y^{12}}$

18. $\sqrt[3]{8a^{12}b^6c^{21}}$

Write a radical expression for each square root.

19. $4x^4y^2$

20. $8|a^3|b^4$

21. $12p^6|q^7|$

Write a radical expression for each cube root.

22. $5m^3n$

23. $7d^6g^9$

24. $2j^7k^5$

11-1 Skills Practice

7MR2.5, 7SDAPI.1

Problem-Solving Investigation: Make a Table

Make a table to solve each problem.

1. **SCIENCE** Ecology students investigated the number of chirps a cricket makes in 15 seconds. Their results are shown below. What is the most common number of chirps made by crickets in a 15-second interval?

30 31 30 32 32 31 30 30 30 31 30 32 31 30 30 31 32
31 30 31 30 30 32 30 30 31 31 32 30 30 32 32 30 30



2. **SPORTS TRAINING** Thirty athletes were surveyed to determine how many hours per week they spend training for a marathon. Organize the data in a table using intervals 1–5, 6–10, 11–15, 16 or more. What is the most common interval of hours practiced in a week?

Interval	Tally	Frequency

4 12 15 6 14 13 9 18 14 8
13 4 11 13 11 2 17 7 14 15
8 11 15 1 12 16 9 18 10 19

3. **BOOKS** Mr. Whitney’s class listed the number of books each student read during the first grading period. The results are shown at the right. Find the number of books read that is listed most frequently.

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

4. **GAS PRICES** A local news station researched the price of gas at 20 gas stations throughout the state and recorded the following results. Organize the data in a table using intervals \$1.99 or less, \$2–\$2.15, more than \$2.15. What is the most common interval of gas prices?

\$2.05 \$2.19 \$2.18 \$2.15 \$2.19 \$2.20 \$2.29 \$2.05 \$1.99 \$2.18
\$2.19 \$2.08 \$2.00 \$2.16 \$2.19 \$1.99 \$2.21 \$2.20 \$2.00 \$2.16

Interval	Tally	Frequency

5. **ATTENDANCE** The number of days students in Ms. Roe’s class were absent are as follows.
- 1 0 3 4 1 0 2 0 3 4 1 3 4 1 2 0 1 2 0 3
4 1 3 4 1 2 0 1 2 4 3 1 2 2 2 1 3 1 1 2

What is the most frequent number of days absent?

11-2

Skills Practice

7SDAP1.1

Histograms

1. BASKETBALL The frequency table at the right shows the average points per game for all NBA teams for the 2004–2005 season. Draw a histogram to represent the set of data.

Average Points per Game for NBA Teams, 2004–2005 Regular Season

Average Points per Game for NBA Teams, 2004–2005 Regular Season

Points	Tally	Frequency
87–90.9	1	1
91–94.9	54	9
95–98.9	551	11
99–102.9	52	7
103–106.9	1	1
107–110.9	1	1

2. GOLF The frequency table at the right shows the score of the winner of the Masters golf tournament for the years 1950–2005. Draw a histogram to represent the set of data.

Score of the Winner of the Masters from 1950–2005

Score of the Winner of the Masters from 1950–2005

Score	Tally	Frequency
266–270	1	1
271–275	52	7
276–280	555554	29
281–285	552	12
286–290	51	6

3. RAINFALL The frequency table at the right shows the average annual precipitation for the 50 states. Draw a histogram to represent the set of data.

Average Annual Precipitation for the 50 States

Average Annual Precipitation for the 50 States

Precipitation (in.)	Tally	Frequency
0–11.9	4	4
12–23.9	54	9
24–35.9	53	8
36–47.9	55552	22
48–59.9	4	4
60–71.9	3	3

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11-3 Skills Practice

7SDAPI.1

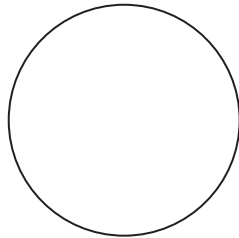
Circle Graphs

Construct a circle graph for each set of data.

1.

U.S. Energy Consumption, 2004	
Type	Percent
Commercial	18%
Transportation	28%
Residential	21%
Industrial	33%

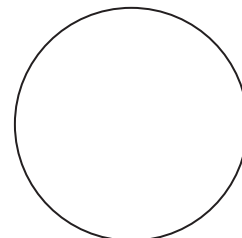
U.S. Energy Consumption, 2004



2.

Type of Trucks Sold in U.S., 2005	
Type	Percent
Compact Pickup	9%
Van	15%
Full-Size Pickup	27%
SUV	45%
Medium/Heavy	4%

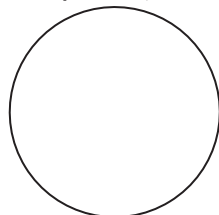
Type of Trucks Sold in U.S., 2005



3.

Davis Cup Winner, 1981–2004	
Country	Wins
Australia	4
France	3
Germany	3
Spain	2
Sweden	6
U.S.	5
Russia	1

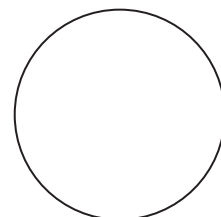
Davis Cup Winner, 1981–2004



4.

Top 5 Largest American Indian Tribes	
Tribe	Number (thousands)
Cherokee	730
Navajo	298
Latin American Indian	181
Choctaw	159
Sioux	153

Top 5 Largest American Indian Tribes



11-4 Skills Practice

7SDAP1.3

Measures of Central Tendency and Range

Find the mean, median, mode, and range of each set of data. Round to the nearest tenth if necessary.

1. 4, 7, 1
2. 2, 1, 2, 3, 2
3. 6, 8, 7, 6, 1
4. 14, 24, 9, 12, 27
5. 16, 12, 23, 24, 16, 27
6. 22, 7, 26, 32, 38, 7
7. 14, 9, 22, 14, 22, 18
8. 36, 35, 36, 32, 35, 36
9. 13, 15, 11, 9, 14, 11, 12
10. 2.4, 2.8, 1.4, 1.7, 2.5, 2.9, 1.5
11. 9, 15, 6, 5, 11, 14, 4, 11
12. 25, 27, 24, 22, 21, 23, 27, 25
13. 35, 26, 33, 32, 26, 27, 29, 30
14. 15, 14, 28, 17, 24, 25, 24, 28, 21
15. 14, 18, 11, 16, 21, 15, 22, 15, 21
16. 5.9, 8.4, 4.2, 4.7, 3.4, 2.8, 1.6, 2.1, 7.5
17. 14, 18, 14, 15, 15, 19, 14, 12, 17, 9
18. 33, 26, 24, 27, 24, 28, 38, 29, 29, 24
19. 17, 25, 15, 19, 14, 21, 21, 15, 17, 24
20. 4.2, 1.7, 6.8, 7.3, 2.1, 5.5, 8.7, 7.6, 3.3, 7.3

11-5**Skills Practice****7SDAP1.3*****Measures of Variation***

Find the range, median, upper and lower quartiles, interquartile range, and any outliers for each set of data.

1. 15, 17, 10, 12, 19, 20, 16
2. 52, 72, 89, 21, 58, 42, 75
3. 20, 23, 18, 21, 4, 17, 15
4. 24, 37, 32, 39, 35, 42, 44, 28
5. 48, 56, 72, 47, 43, 36, 47, 14
6. 116, 107, 105, 113, 112, 123, 115, 108
7. 2.2, 2.6, 2.5, 3.6, 2.9, 2.8, 2.2, 2.4
8. 59, 72, 57, 51, 62, 77, 73, 64, 54
9. 81, 79, 88, 67, 89, 87, 85, 83, 83
10. 132, 116, 108, 113, 126, 120, 131, 112, 126
11. 6.3, 6.7, 6.2, 4.9, 6.7, 6.6, 5.3, 6.3, 6.4
12. 22, 27, 25, 11, 29, 28, 41, 26, 28, 23
13. 90, 88, 72, 85, 92, 95, 93, 86, 92, 91
14. 107, 114, 124, 108, 117, 106, 107, 109, 117, 115
15. 8.3, 8.5, 9.5, 8.7, 8.9, 8.3, 8.6, 8.8, 8.9, 8.7
16. 42, 36, 58, 47, 34, 43, 54, 49, 48, 41, 38
17. 8.3, 9.0, 8.1, 9.5, 8.2, 8.9, 9.4, 7.9, 8.3, 8.4, 8.0
18. 15, 16, 18, 9, 18, 17, 19, 19, 10, 12, 15, 13, 16

11-6

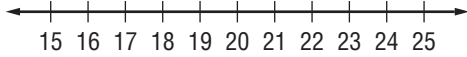
Skills Practice

7SDAP1.1

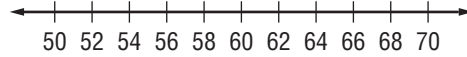
Box-and-Whisker Plots

Construct a box-and-whisker plot for each set of data.

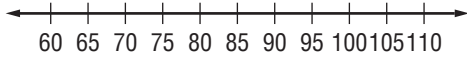
1. 23, 21, 20, 22, 24, 17, 15



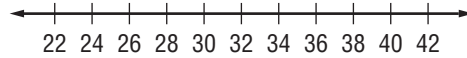
2. 54, 61, 64, 68, 60, 53, 66



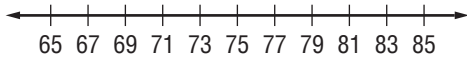
3. 61, 96, 97, 87, 84, 91, 98, 86



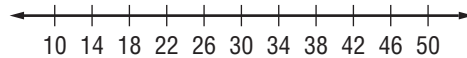
4. 27, 35, 35, 32, 26, 34, 36, 27, 38



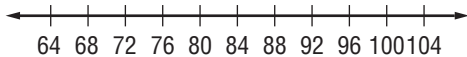
5. 67, 74, 78, 69, 78, 70, 67, 72, 69



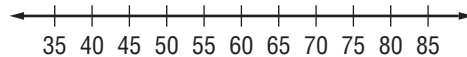
6. 39, 41, 30, 14, 44, 40, 48, 39, 40, 36



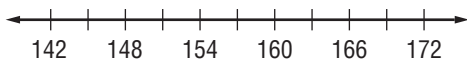
7. 86, 83, 98, 99, 81, 86, 95, 84, 79, 90



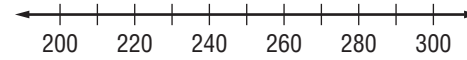
8. 45, 58, 78, 57, 58, 55, 61, 47, 52, 40, 46



9. 169, 163, 153, 166, 149, 148, 146, 145, 152, 163, 152



10. 245, 250, 205, 240, 250, 275, 260, 295, 255, 225, 250



11-7

Skills Practice

7SDAPI.1

Stem-and-Leaf Plots

Display each set of data in a stem-and-leaf plot.

1. {7, 2, 3, 11, 20, 21, 17, 15, 15, 14}

2. {8, 2, 14, 27, 7, 2, 16, 13, 29, 16}

3.

Amount of Fresh Fruit Consumed per Person in the United States, 2002	
Fruit	Pounds Consumed per Person
Apples	16
Bananas	27
Cantaloupes	11
Grapefruit	5
Grapes	9
Oranges	11
Peaches and nectarines	5
Pears	3
Pineapples	4
Plums and prunes	1
Strawberries	5
Watermelons	14

Source: U.S. Census Bureau

4.

Winning Scores in College Football Bowl Games, 2005	
Game and Winning School	Points Scored
Alamo Bowl, Nebraska	32
Cotton Bowl, Alabama	13
Emerald Bowl, Utah	38
Fiesta Bowl, Ohio St.	34
Gator Bowl, Virginia Tech	35
Holiday Bowl, Oklahoma	17
Liberty Bowl, Tulsa	31
Orange Bowl, Penn State	26
Outback Bowl, Florida	31
Peach Bowl, LSU	40
Rose Bowl, Texas	41
Sugar Bowl, West Virginia	38

Source: football.about.com

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HUMIDITY For Exercises 5–7, use the information in the back-to-back stem-and-leaf plot. Source: *The New York Public Library Desk Reference*

5. What is the highest morning relative humidity?
 6. What is the lowest afternoon relative humidity?
 7. Does relative humidity tend to be higher in the morning or afternoon?

U.S. Average Relative Humidity (percent)	
Morning	Afternoon
	5 1 2 3 4 7 9
	6
8 8 4	7
9 4 0	8
8 7 = 78%	5 3 = 53%

11-8**Skills Practice**

7SDAPI.1

Select an Appropriate Display**Select an appropriate type of display for each situation. Justify your reasoning.**

- energy usage in your home for the past year, categorized by month
- exam scores for a whole class, arranged in intervals
- sales of a leading brand of toothpaste for the last 10 years
- average weight of a pet dog, categorized by breed
- runs scored by individual members of a baseball team, as compared to the team total
- ages of all 40 employees of a small company

Select an appropriate type of display for each situation. Justify your reasoning. Then construct a display.

7.

Points per Game by Shaquille O'Neal, 1998–2005	
Season	Points per Game
97–98	28.3
98–99	26.3
99–00	29.7
00–01	28.7
01–02	27.2
02–03	27.5
03–04	21.5
04–05	22.9

8.

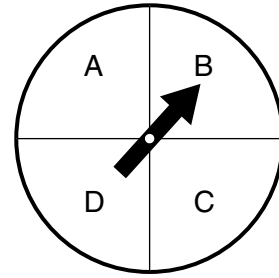
Share of Workers by Commute Time, 2000	
Commute Time	Percent of Workers
Less than 15 min	30%
15–29 min	36%
30–39 min	16%
40–59 min	11%
60 min or more	7%

12-2 Skills Practice

6SDAP3.1

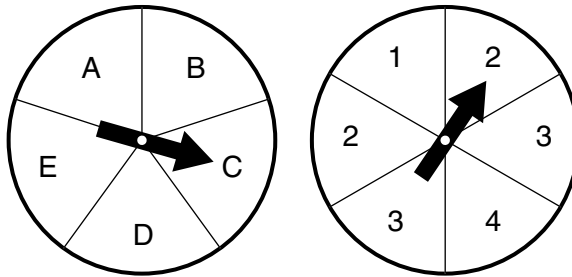
Probability of Compound Events

For Exercises 1–6, a number cube is rolled and the spinner at the right is spun. Find each probability.



1. $P(1 \text{ and } A)$
2. $P(\text{odd and } B)$
3. $P(\text{prime and } D)$
4. $P(\text{greater than } 4 \text{ and } C)$
5. $P(\text{less than } 3 \text{ and consonant})$
6. $P(\text{prime and consonant})$
7. What is the probability of spinning the spinner above 3 times and getting a vowel each time?
8. What is the probability of rolling a number cube 3 times and getting a number less than 3 each time?

Each spinner at the right is spun. Find each probability.



9. $P(A \text{ and } 2)$
10. $P(\text{vowel and even})$
11. $P(\text{consonant and } 1)$
12. $P(D \text{ and greater than } 1)$

There are 3 red, 1 blue, and 2 yellow marbles in a bag. Once a marble is selected, it is not replaced. Find each probability.

13. $P(\text{red and then yellow})$
14. $P(\text{blue and then yellow})$
15. $P(\text{red and then blue})$
16. $P(\text{two yellow marbles})$
17. $P(\text{two red marbles in a row})$
18. $P(\text{three red marbles})$

GAMES There are 13 yellow cards, 6 blue, 10 red, and 8 green cards in a stack of cards turned face down. Once a card is selected, it is not replaced. Find each probability.

19. $P(2 \text{ blue cards})$
20. $P(2 \text{ red cards})$
21. $P(\text{a yellow card and then a green card})$
22. $P(\text{a blue card and then a red card})$
23. $P(\text{two cards that are not red})$
24. $P(\text{two cards that are neither red or green})$

12-3 Skills Practice

6SDAP3.2

Experimental and Theoretical Probability

Use the table that shows the results of rolling a number cube 50 times.

Result	Number of Times
1	6
2	10
3	8
4	7
5	10
6	9

- Based on the results, what is the probability of getting a five?
- Based on the results, how many fives would you expect to occur in 300 rolls?
- What is the theoretical probability of getting a five?
- Based on the theoretical probability, how many fives would you expect to occur in 300 rolls?
- Compare the theoretical probability to the experimental probability.

ARCHERY Use the following information.

In archery class, Jocelyn missed the target 5 times in 40 shots.

- What is the probability that her next shot will miss the target?
- In her next 160 shots, how many times would you expect Jocelyn to miss the target?

PETS For Exercises 8–11, use the results of a survey of 200 people shown at the right.

First Pet	Number
bird	32
cat	56
dog	66
rabbit	19
other	27

- What is the probability that a person says his or her first pet was a cat?
- Out of 500 people, how many would you expect to say a cat was his or her first pet?
- What is the probability that a person says his or her first pet was a bird?
- Out of 500 people, how many would you expect to say a bird was their first pet?
- FIGURE SKATING** At figure skating practice, Michelle successfully landed 15 out of 18 attempts at a double axel. What is the experimental probability that she will successfully land a double axel?

12-4 Skills Practice

7MR2.5, 6SDAP3.2

Problem-Solving Investigation: Act It Out

For Exercises 1–7, use the act it out strategy to solve.

1. A piece on a game board moves forward 8 spaces on its first turn and moves backward 3 spaces on its second turn. If the pattern continues, how many turns will it take for the piece to move at least 30 spaces?
2. How many ways can you arrange 3 paintings in a row on a wall?
3. How many different combinations of nickels, dimes, and pennies can be used to make \$0.10?
4. A piece on a game board moves forward 6 spaces on its first turn and moves backward 5 spaces on its second turn. If the pattern continues, how many turns will it take for the piece to move at least 10 spaces?
5. Joey is taller than Greg, who is taller than Rick, who is taller than Mike. How many different ways can they stand in line so that the tallest person is always last?
6. How many different combinations of quarters, nickels, dimes, and pennies can be used to make \$0.25?
7. Roll a number cube 10 times and record the results. Repeat 3 times. Using your results, is there any way to predict which number the number cube will land?

	Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6	Roll 7	Roll 8	Roll 9	Roll 10
Set 1										
Set 2										
Set 3										

12-5 Skills Practice**6SDAP2.5*****Using Sampling to Predict*****Describe each sample.**

1. To evaluate the defect rate of its memory chips, an integrated circuit manufacturer tests every 100th chip off the production line.
2. Students who wish to represent the school at a school board meeting are asked to stop by the office after lunch.
3. To determine if the class understood the homework assignment, the math teacher checks the top 3 papers in the pile of collected homework.
4. To determine the representatives to the recess activities meeting, 2 students are selected at random from each homeroom.
5. A member of the cafeteria staff asks every fifth student leaving the cafeteria to rank 5 vegetables from most favorite to least favorite.
6. One bead for every member of the school orchestra is placed in a bag. All but 2 of the beads are white. Each member draws a bead from the bag, and the members who pick the non-white beads will represent the orchestra.
7. A real estate agent surveys people about their housing preferences at an open house for a luxury townhouse.
8. To determine the most popular children's programs, a television station asks parents to call in and complete a phone survey.
9. Two teachers from each school in the district are chosen at random to fill out a survey on classroom behavior.
10. Airline boarding passes are marked with red stars at random to decide which passengers should have their carry-on luggage inspected.
11. To determine how often people eat out, every tenth person entering a Chinese restaurant is surveyed.



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