

EXAMPLE 5 Find unknown length

The base of a triangle is 28 meters. Its area is 308 square meters. Find the height of the triangle.

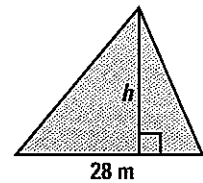
Solution

$$A = \frac{1}{2}bh \quad \text{Write formula for the area of a triangle.}$$

$$308 = \frac{1}{2}(28)h \quad \text{Substitute 308 for } A \text{ and 28 for } b.$$

$$22 = h \quad \text{Solve for } h.$$

▶ The height is 22 meters.



✓ GUIDED PRACTICE for Example 5

7. The area of a triangle is 64 square meters, and its height is 16 meters. Find the length of its base.

1.7 EXERCISES

HOMEWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS2 for Exs. 7, 21, and 41
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 19, 26, 38, and 45
- ◆ = MULTIPLE REPRESENTATIONS Ex. 44

SKILL PRACTICE

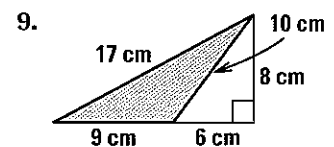
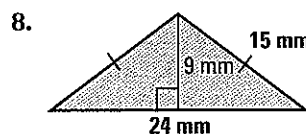
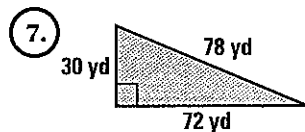
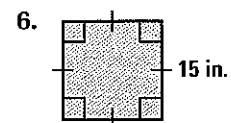
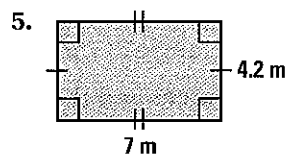
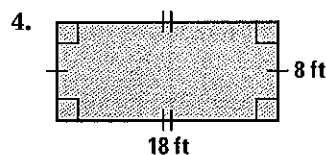
- VOCABULARY** How are the diameter and radius of a circle related?
- ★ **WRITING** Describe a real-world situation in which you would need to find a perimeter, and a situation in which you would need to find an area. What measurement units would you use in each situation?
- ERROR ANALYSIS** Describe and correct the error made in finding the area of a triangle with a height of 9 feet and a base of 52 feet.

$$A = 52(9) = 468 \text{ ft}^2$$



EXAMPLE 1
on p. 49
for Exs. 3–10

PERIMETER AND AREA Find the perimeter and area of the shaded figure.



at classzone.com

EXAMPLE 2
on p. 50
for Exs. 11–15

10. DRAWING A DIAGRAM The base of a triangle is 32 feet. Its height is $16\frac{1}{2}$ feet. Sketch the triangle and find its area.

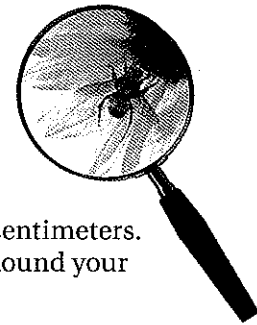
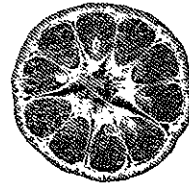
CIRCUMFERENCE AND AREA Use the given diameter d or radius r to find the circumference and area of the circle. Round to the nearest tenth.

11. $d = 27$ cm

12. $d = 5$ in.

13. $r = 12.1$ cm

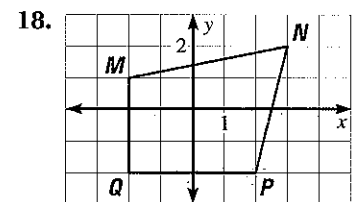
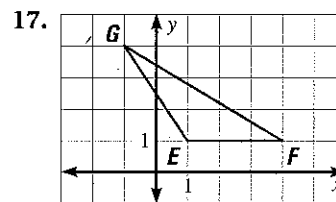
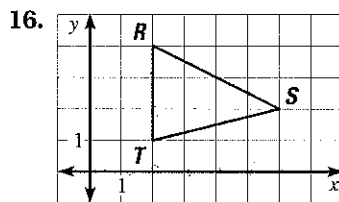
14. $r = 3.9$ cm



15. DRAWING A DIAGRAM The diameter of a circle is 18.9 centimeters. Sketch the circle and find its circumference and area. Round your answers to the nearest tenth.

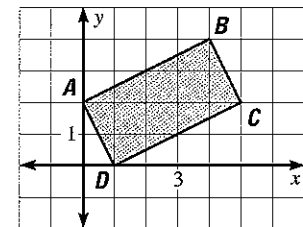
EXAMPLE 3
on p. 50
for Exs. 16–19

DISTANCE FORMULA Find the perimeter of the figure. Round to the nearest tenth of a unit.



19. ★ MULTIPLE CHOICE What is the approximate area (in square units) of the rectangle shown at the right?

- (A) 6.7 (B) 8.0
(C) 9.0 (D) 10.0



EXAMPLE 4
on p. 51
for Exs. 20–26

CONVERTING UNITS Copy and complete the statement.

20. $187 \text{ cm}^2 = \underline{\quad} \text{ m}^2$ (21.) $13 \text{ ft}^2 = \underline{\quad} \text{ yd}^2$ 22. $18 \text{ in.}^2 = \underline{\quad} \text{ ft}^2$
23. $8 \text{ km}^2 = \underline{\quad} \text{ m}^2$ 24. $12 \text{ yd}^2 = \underline{\quad} \text{ ft}^2$ 25. $24 \text{ ft}^2 = \underline{\quad} \text{ in.}^2$

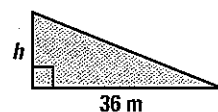
26. ★ MULTIPLE CHOICE A triangle has an area of 2.25 square feet. What is the area of the triangle in square inches?

- (A) 27 in.^2 (B) 54 in.^2 (C) 144 in.^2 (D) 324 in.^2

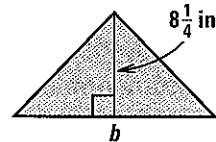
EXAMPLE 5
on p. 52
for Exs. 27–30

UNKNOWN MEASURES Use the information about the figure to find the indicated measure.

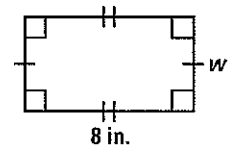
27. Area = 261 m^2
Find the height h .



28. Area = 66 in.^2
Find the base b .



29. Perimeter = 25 in.
Find the width w .

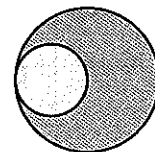


30. **UNKNOWN MEASURE** The width of a rectangle is 17 inches. Its perimeter is 102 inches. Find the length of the rectangle.
31. **ALGEBRA** The area of a rectangle is 18 square inches. The length of the rectangle is twice its width. Find the length and width of the rectangle.
32. **ALGEBRA** The area of a triangle is 27 square feet. Its height is three times the length of its base. Find the height and base of the triangle.
33. **ALGEBRA** Let x represent the side length of a square. Find a regular polygon with side length x whose perimeter is twice the perimeter of the square. Find a regular polygon with side length x whose perimeter is three times the length of the square. *Explain* your thinking.

FINDING SIDE LENGTHS Find the side length of the square with the given area. Write your answer as a radical in simplest form.

34. $A = 184 \text{ cm}^2$ 35. $A = 346 \text{ in.}^2$ 36. $A = 1008 \text{ mi}^2$ 37. $A = 1050 \text{ km}^2$

38. **★ SHORT RESPONSE** In the diagram, the diameter of the yellow circle is half the diameter of the red circle. What fraction of the area of the red circle is *not* covered by the yellow circle? *Explain*.



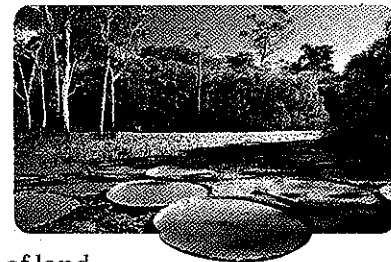
39. **CHALLENGE** The area of a rectangle is 30 cm^2 and its perimeter is 26 cm. Find the length and width of the rectangle.

PROBLEM SOLVING

EXAMPLES 1 and 2
on pp. 49–50
for Exs. 40–41

40. **WATER LILIES** The giant Amazon water lily has a lily pad that is shaped like a circle. Find the circumference and area of a lily pad with a diameter of 60 inches. Round your answers to the nearest tenth.

@HomeTutor for problem solving help at classzone.com



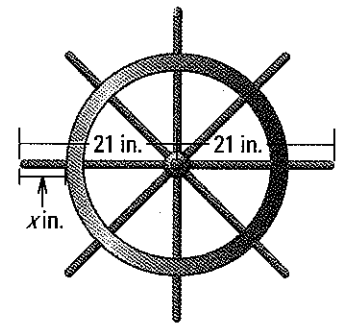
41. **LAND** You are planting grass on a rectangular plot of land. You are also building a fence around the edge of the plot. The plot is 45 yards long and 30 yards wide. How much area do you need to cover with grass seed? How many feet of fencing do you need?

@HomeTutor for problem solving help at classzone.com

EXAMPLE 4
on p. 51
for Ex. 42

42. **MULTI-STEP PROBLEM** Chris is installing a solar panel. The maximum amount of power the solar panel can generate in a day depends in part on its area. On a sunny day in the city where Chris lives, each square meter of the panel can generate up to 125 watts of power. The flat rectangular panel is 84 centimeters long and 54 centimeters wide.
- Find the area of the solar panel in square meters.
 - What is the maximum amount of power (in watts) that the panel could generate if its area was 1 square meter? 2 square meters? *Explain*.
 - Estimate the maximum amount of power Chris's solar panel can generate. *Explain* your reasoning.

43. **MULTI-STEP PROBLEM** The eight spokes of a ship's wheel are joined at the wheel's center and pass through a large wooden circle, forming handles on the outside of the circle. From the wheel's center to the tip of the handle, each spoke is 21 inches long.



- The circumference of the outer edge of the large wooden circle is 94 inches. Find the radius of the outer edge of the circle to the nearest inch.
- Find the length x of a handle on the wheel. *Explain.*

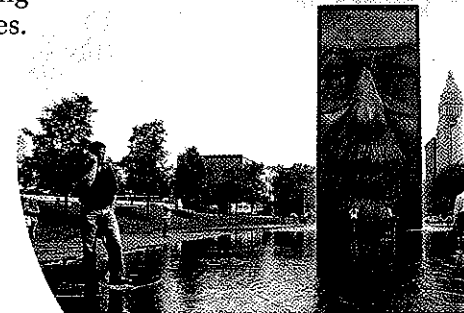
44. **MULTIPLE REPRESENTATIONS** Let x represent the length of a side of a square. Let y_1 and y_2 represent the perimeter and area of that square.

- a. **Making a Table** Copy and complete the table.

Length, x	1	2	5	10	25
Perimeter, y_1	?	?	?	?	?
Area, y_2	?	?	?	?	?

- Making a Graph** Use the completed table to write two sets of ordered pairs: (x, y_1) and (x, y_2) . Graph each set of ordered pairs.
- Analyzing Data** Describe any patterns you see in the table from part (a) and in the graphs from part (b).

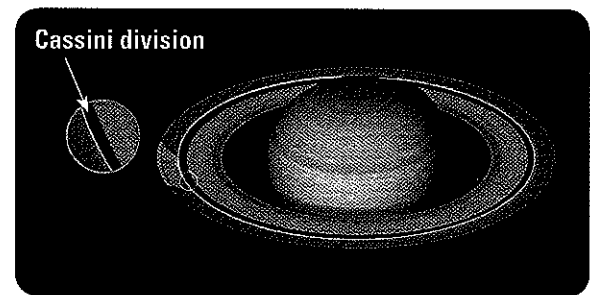
45. **★ EXTENDED RESPONSE** The photograph at the right shows the Crown Fountain in Chicago, Illinois. At this fountain, images of faces appear on a large screen. The images are created by light-emitting diodes (LEDs) that are clustered in groups called modules. The LED modules are arranged in a rectangular grid.



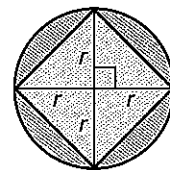
- The rectangular grid is approximately 7 meters wide and 15.2 meters high. Find the area of the grid.
- Suppose an LED module is a square with a side length of 4 centimeters. How many rows and how many columns of LED modules would be needed to make the Crown Fountain screen? *Explain* your reasoning.

46. **ASTRONOMY** The diagram shows a gap in Saturn's circular rings. This gap is known as the *Cassini division*. In the diagram, the red circle represents the ring that borders the inside of the Cassini division. The yellow circle represents the ring that borders the outside of the division.

- The radius of the red ring is 115,800 kilometers. The radius of the yellow ring is 120,600 kilometers. Find the circumference of the red ring and the circumference of the yellow ring. Round your answers to the nearest hundred kilometers.
- Compare the circumferences of the two rings. About how many kilometers greater is the yellow ring's circumference than the red ring's circumference?



47. **CHALLENGE** In the diagram at the right, how many times as great is the area of the circle as the area of the square? *Explain* your reasoning.



48. **ALGEBRA** You have 30 yards of fencing with which to make a rectangular pen. Let x be the length of the pen.

- Write an expression for the width of the pen in terms of x . Then write a formula for the area y of the pen in terms of x .
- You want the pen to have the greatest possible area. What length and width should you use? *Explain* your reasoning.

MIXED REVIEW

PREVIEW

Prepare for
Lesson 2.1
in Exs. 49–50.

49. Use the equation $y = 2x + 1$ to copy and complete the table of values. (p. 884)

x	1	2	3	4	5
y	?	?	?	?	?

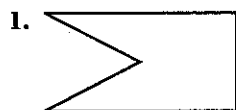
50. Each number in a pattern is 6 less than the previous number. The first number in the pattern is 100. Write the next three numbers. (p. 894)

In Exercises 51 and 52, draw a diagram to represent the problem. Then find the indicated measure. (p. 42)

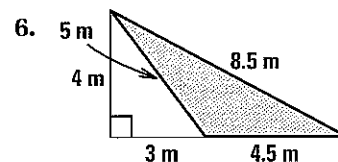
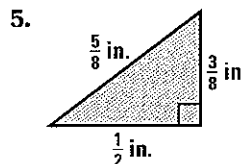
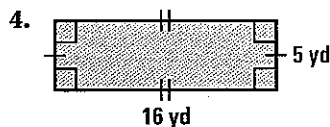
- The lengths (in inches) of two sides of a regular triangle are given by the expressions $5x + 40$ and $8x - 13$. Find the length of a side of the triangle.
- The measures of two angles of an equiangular hexagon are $12x^\circ$ and $(10x + 20)^\circ$. Find the measure of an angle of the hexagon.

QUIZ for Lessons 1.6–1.7

Tell whether the figure is a polygon. If it is not, *explain* why. If it is a polygon, tell whether it is *convex* or *concave*. (p. 42)



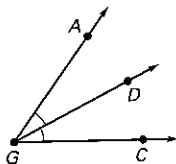
Find the perimeter and area of the shaded figure. (p. 49)



- GARDENING** You are spreading wood chips on a rectangular garden. The garden is $3\frac{1}{2}$ yards long and $2\frac{1}{2}$ yards wide. One bag of wood chips covers 10 square feet. How many bags of wood chips do you need? (p. 49)

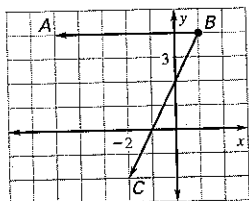
31. $m\angle XWZ = 35.5^\circ$, $m\angle YWZ = 35.5^\circ$ 33. 38°
35. 142° 37. 53°

39. If a ray bisects $\angle AGC$, then its endpoint must be point G. *Sample:*

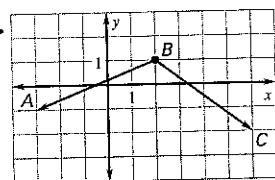


41. 80° 43. 75° ; both angle measures are 5° less.

45. *Acute.*
Sample answer: $(-2, 0)$



47. *Obtuse.*
Sample answer: $(2, 0)$



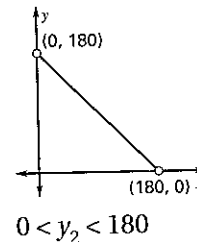
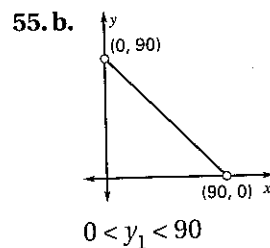
- 1.4 Problem Solving** (pp. 31–32) 51. 32° 53. a. 112°
b. 56° c. 56° d. 56° 55. *Sample answer:* acute: $\angle ABG$,
obtuse: $\angle ABC$, right: $\angle DGE$, straight: $\angle DGF$
57. about 140° 59. about 62° 61. about 107°

1.5 Skill Practice (pp. 38–40)

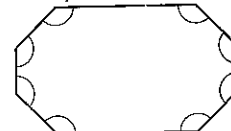
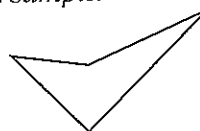
1. No. *Sample answer:* Any two angles whose angle measures add up to 90° are complementary, but they do not have to have a common vertex and side.

3. adjacent 5. adjacent 7. $\angle GLH$ and $\angle HLJ$, $\angle GLJ$ and $\angle JLK$ 9. 69° 11. 85° 13. 25° 15. 153° 17. 135° , 45°
19. 54° , 36° 21. linear pair 23. vertical angles
25. linear pair 27. neither 29. The angles are complementary so they should be equal to 90° ;
 $x + 3x = 90^\circ$, $4x = 90^\circ$, $x = 22.5$. 31. 10, 35 33. 55, 30
35. Never; a straight angle is 180° , and it is not possible to have a complement of an angle that is 180° .
37. Always; the sum of complementary angles is 90° , so each angle must be less than 90° , making them acute. 39. 71° , 19° 41. 68° , 22° 43. 58° , 122°

- 1.5 Problem Solving** (pp. 40–41) 47. neither
49–51. *Sample answers* are given. 49. $\angle FGB$, $\angle BGC$
51. $\angle AGE$, $\angle EGD$ 53. *Sample answer:* Subtract 90° from $m\angle FGB$. 55. a. $y_1 = 90 - x$, $0 < x < 90$;
 $y_2 = 180 - x$, $0 < x < 180$; the measure of the complement must be less than 90° and the measure of its supplement must be less than 180° .



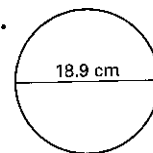
- 1.6 Skill Practice** (pp. 44–46) 1. An n -gon is a polygon with n sides. 3. polygon; concave 5. polygon; convex 9. Pentagon; regular; it has 5 congruent sides and angles. 11. Triangle; none of these; the sides and/or the angles are not all congruent. 13. Quadrilateral; equiangular; it has 4 congruent angles.
15. 8 in. 17. 3 ft 19. sometimes 21. never 23. never
25. *Sample:* 27. *Sample:*



29. 1

- 1.6 Problem Solving** (pp. 46–47) 33. triangle; regular
35. octagon; regular 39. 105 mm; each side of the button is 15 millimeters long, so the perimeter of the button is $15(7) = 105$ millimeters. 41. a. 3 b. 5 c. 6 d. 8

- 1.7 Skill Practice** (pp. 52–54) 1. *Sample answer:* The diameter is twice the radius. 3. $(52)(9)$ must be divided by 2; $\frac{52(9)}{2} = 234 \text{ ft}^2$. 5. 22.4 m, 29.4 m^2
7. 180 yd, 1080 yd^2 9. 36 cm, 36 cm^2 11. 84.8 cm, 572.3 cm^2 13. 76.0 cm, 459.7 cm^2
15. 59.3 cm, 280.4 cm^2



17. 12.4 21. 1.44 23. 8,000,000 25. 3,456 27. 14.5 m
29. 4.5 in. 31. 6 in., 3 in. 33. Octagon; dodecagon; the square has 4 sides, so a polygon with the same side length and twice the perimeter would have to have $2(4) = 8$ sides, an octagon; a polygon with the same side length and three times the perimeter would have to have $4(3) = 12$ sides, a dodecagon. 35. $\sqrt{346}$ in.
37. $5\sqrt{42}$ km

- 1.7 Problem Solving** (pp. 54–56) 41. 1350 yd^2 ; 450 ft
43. a. 15 in. b. 6 in.; the spoke is 21 inches long from the center to the tip, and it is 15 inches from the center to the outer edge, so $21 - 15 = 6$ inches is the length of the handle.

45. a. 106.4 m^2 b. 380 rows, 175 columns. *Sample answer:* The panel is 1520 centimeters high and each module is 4 centimeters so there are $1520 \div 4 = 380$ rows; the panel is 700 centimeters wide and each module is 4 centimeters therefore there are $700 \div 4 = 175$ columns.

1.7 Problem Solving Workshop (p. 57)

1. 2.4 h 3. \$26,730

Chapter Review (pp. 60–63) 1. endpoints 3. midpoint

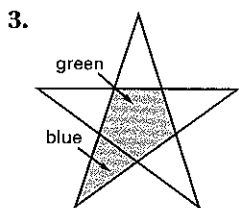
5. *Sample answer:* points P, Y, Z 7. \vec{YZ} , \vec{YX} 9. 1.2
11. 7 13. 16 15. 8.6; (3.5, 3.5) 17. 16.4; (5, -0.5)
19. 5 21. 162° ; obtuse 23. 7° 25. 88° 27. 124° 29. 168°
31. 92° , 88° ; obtuse 33. Quadrilateral; equiangular; it has four congruent angles but its four sides are not all congruent. 35. 21 37. 14 in., 11.3 in.² 39. 5 m

Algebra Review (p. 65) 1. 6 3. -2 5. $1\frac{1}{2}$ 7. 4 9. -11

11. 17 people

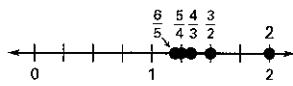
Chapter 2

2.1 Skill Practice (pp. 75–76) 1. *Sample answer:* A guess based on observation



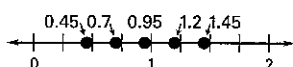
3. 7. The numbers are 4 times the previous number; 768. 9. The rate of decrease is increasing by 1; -6. 11. The numbers are increasing by successive multiples of 3; 25. 13. even

15. *Sample answer:* $(3 + 4)^2 = 7^2 = 49 \neq 3^2 + 4^2 = 9 + 16 = 25$ 17. *Sample answer:* $3 \cdot 6 = 18$ 19. To be true, a conjecture must be true for all cases. 21. $y = 2x$
23. Previous numerator becomes the next denominator while the numerator is one more

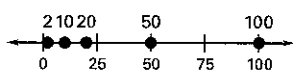


than the denominator; $\frac{6}{5}$.

25. 0.25 is being added to each number; 1.45.



27. Multiply the first number by 10 to get the second number, take half of the second number to get the third number, and repeat the pattern; 500.

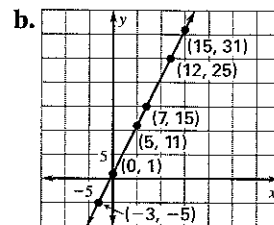


29. $r > 1$; $0 < r < 1$; raising numbers greater than one by successive natural numbers increases the result while raising a number between 0 and 1 by successive natural numbers decreases the result.

2.1 Problem Solving (pp. 77–78) 33. *Sample answer:* The number of e-mail messages will increase in 2004; the number of e-mail messages has increased for the past 7 years.

35. a.

x	y
-3	-5
0	1
5	11
7	15
12	25
15	31



c. Double the value of x and add 1 to the result, $y = 2x + 1$. 37. a. sum, two b. 144, 233, 377 c. *Sample answer:* spiral patterns on the head of a sunflower

2.2 Skill Practice (pp. 82–84) 1. converse 3. If $x = 6$, then $x^2 = 36$. 5. If a person is registered to vote, then they are allowed to vote. 7. If two angles are complementary, then they add to 90° ; if two angles add to 90° , then they are complementary; if two angles are not complementary, then they do not add to 90° ; if two angles do not add to 90° , then they are not complementary. 9. If $x = 2$, then $3x + 10 = 16$; if $3x + 10 = 16$, then $x = 2$; if $x \neq 2$, then $3x + 10 \neq 16$; if $3x + 10 \neq 16$, then $x \neq 2$.

11. False. *Sample:*

13. False. *Sample answer:* $m\angle ABC = 60^\circ$, $m\angle GEF = 120^\circ$ 15. False. *Sample answer:* 2
17. False; there is no indication of a right angle in the diagram. 19. An angle is obtuse if and only if its measure is between 90° and 180° . 21. Points are coplanar if and only if they lie in the same plane. 23. good definition 27. If $-x > -6$, then $x < 6$; true. 29. *Sample answer:* If the dog sits, she gets a treat.

2.2 Problem Solving (pp. 84–85) 31. true 33. Find a counterexample. *Sample answer:* Tennis is a sport, but the participants do not wear helmets. 35. *Sample answer:* If a student is a member of the jazz band, then the student is a member of the band but not the chorus. 37. no

2.3 Skill Practice (pp. 90–91) 1. Detachment
3. *Sample answer:* The door to this room is closed.
5. $-15 < -12$ 7. If a rectangle has four equal side lengths, then it is a regular polygon. 9. If you play the clarinet, then you are a musician. 11. The sum is even; the sum of two even integers is even; $2n$ and $2m$ are even, $2n + 2m = 2(n + m)$, $2(n + m)$ is even.