Measurement and Geometry

Solutions Key

ARE YOU READY?

1. trapezoid

2. parallelogram

3. radius; diameter

4. 1,535
Nearest ten: 1,540
Nearest hundred: 1,500

5. 294
Nearest ten: 290
Nearest hundred: 300

6. 30,758
Nearest ten: 30,760
Nearest hundred: 30,800

7. 497
Nearest ten: 500
Nearest hundred: 500

8. 6.18
Nearest whole number: 6
Nearest tenth: 6.2

9. 10.50
Nearest whole number: 11
Nearest tenth: 10.5

10. 513.93
Nearest whole number: 514
Nearest tenth: 513.9

11. 29.06
Nearest whole number: 29
Nearest tenth: 29.1

12. $5.63 \cdot 8 = 45.04$

13. $9.67 \cdot 4.3 = 41.581$

14. $8.34 \cdot 16 = 133.44$

15. $6.08 \cdot 0.56 = 3.4048$

16. $0.82 \cdot 21 = 17.22$

17. $2.74 \cdot 6.6 = 18.084$

18. $40 \cdot 9.54 = 381.60$

19. $0.33 \cdot 0.08 = 0.0264$

20. $2 \cdot 9 + 2 \cdot 9$
$18 + 12$
30

21. $2(15 + 8)$
$2(23)$
46

22. $4 \cdot 6.8 + 7 \cdot 9.3$
$27.2 + 65.1$
92.3

23. $14(25.9 + 13.6)$
$14(39.5)$
553

24. $(27.3 + 0.7) \div 2^2$
$28 \div 4$
7

25. $5 \cdot 3^3 - 8.02$
$5 \cdot 27 - 8.02$
$135 - 8.02$
126.98

26. $(63 \div 7) \cdot 4^2$
$9 \cdot 16$
144

27. $1.1 + 3 \cdot 4.3$
$1.1 + 12.9$
14

28. $66 \cdot [5 + (3 + 3)^2]$
$66 \cdot [5 + 36]$
$66 \cdot [41]$
$2{,}706$

29. trapezoid

30. triangle

31. parallelogram

LESSON 1

Think and Discuss

1. Possible answer: Add the lengths of the four sides. Or multiply twice the length and twice the width, and then find the sum of the products.

2. Possible answer: Multiply the radius by 2 to find the diameter, and then substitute the value for the diameter into the formula.

Exercises

1. $P = 6 + 4 + 8$
$P = 18$
The perimeter of the triangle is 18 m.

2. $P = 7 + 5 + 7 + 5$
$P = 24$
The perimeter of the parallelogram is 24 in.

3. $P = 8 + 8 + 8 + 8$
$P = 32$
The perimeter of the square is 32 ft.

4. $P = 2\ell + 2w$
$P = (2 \cdot 12) + (2 \cdot 6)$
$P = 24 + 12$
$P = 36$
The perimeter of the rectangle is 36 in.

5. $P = 2\ell + 2w$
$P = (2 \cdot 8) + (2 \cdot 2)$
$P = 16 + 4$
$P = 20$
The perimeter of the rectangle is 20 m.

6. $P = 2\ell + 2w$
$P = \left(2 \cdot 4\frac{1}{2}\right) + \left(2 \cdot 1\frac{1}{2}\right)$
$P = 9 + 3$
$P = 12$
The perimeter of the rectangle is 12 ft.

7. $C = \pi d$
$C \approx 3.14 \cdot 12$
$C \approx 37.68$
The circumference of the circle is about 37.7 m.

8. $C = \pi d$
$C \approx 3.14 \cdot 3$
$C \approx 9.42$
The circumference of the circle is about 9.4 ft.

9. $C = 2\pi r$
$C \approx 2 \cdot \frac{22}{7} \cdot 21$
$C \approx 132$
The circumference of the circle is about 132 in.

10. $C = \pi d$
$440 \approx 3.14 \cdot d$
$440 \div 3.14 \approx 3.14d \div 3.14$
$140.127 \approx d$
The diameter of the Ferris wheel is about 140 ft.

11. $P = 12 + 12 + 12 + 12$
$P = 48$
The perimeter of the rhombus is 48 cm.

12. $P = 7 + 13 + 10$
$P = 30$
The perimeter of the triangle is 30 ft.

13. $P = 8 + 10 + 10 + 16$
$P = 44$
The perimeter of the trapezoid is 44 m.

14. $P = 2\ell + 2w$
$P = (2 \cdot 8) + (2 \cdot 5)$
$P = 16 + 10$
$P = 26$
The perimeter of the rectangle is 26 in.

15. $P = 2\ell + 2w$
$P = (2 \cdot 3) + (2 \cdot 1)$
$P = 6 + 2$
$P = 8$
The perimeter of the rectangle is 8 ft.

16. $P = 2\ell + 2w$
$P = (2 \cdot 10.2) + (2 \cdot 8)$
$P = 20.4 + 16$
$P = 36.4$
The perimeter of the rectangle is 36.4 cm.

17. $C = \pi d$
$C \approx \frac{22}{7} \cdot 35$
$C \approx \frac{770}{7}$
$C \approx 110$
The circumference of the circle is about 110 cm.

18. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 3$
$C \approx 18.84$
The circumference of the circle is about 18.8 m.

19. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 5.1$
$C \approx 32.028$
The circumference of the circle is about 32.0 in.

20. $C = \pi d$
$91 \approx 3.14 \cdot d$
$91 \div 3.14 \approx 3.14d \cdot 3.14$
$28.98 \approx d$
The diameter is about 29 in.

21. $C = \pi d$
$17.8 \approx 3.14 \cdot d$
$17.8 \div 3.14 \approx 17.8d \cdot 3.14$
$5.67 \approx d$
$r = d \div 2$
$= 5.67 \div 2$
$= 2.835$
The diameter is about 5.7 m, and the radius is about 2.8 m.

22. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 6.7$
$C \approx 42.076$
$d = r \cdot 2$
$= 6.7 \cdot 2$
$= 13.4$
The circumference is about 42.1 yd, and the diameter is about 13.4 yd.

23. $C = \pi d$
$C \approx 3.14 \cdot 10.6$
$C \approx 33.284$
$r = d \div 2$
$= 10.6 \div 2$
$= 5.3$
The circumference is about 33.3 in., and the radius is about 5.3 in.

24. $C = \pi d$
$\pi \approx \pi \cdot d$
$\pi \div \pi \approx \pi d \div \pi$
$1 \approx d$
$r = d \div 2$
$= 1 \div 2$
$= \frac{1}{2}$
The diameter is about 1 unit, and the radius is about a $\frac{1}{2}$ unit.

25. $C = \pi d$
$C \approx \pi \cdot 24.2$
$C \approx 75.988$ ft
$\frac{12 \text{ in.}}{1 \text{ ft}} = \frac{x}{76 \text{ ft}}$
$1 \cdot x = 12 \cdot 76$
$x = 912$ in.
$C \approx 912$ in.
912 in. $\div$ 57-in. strands $=$ 16 strands
16 strands of lights are needed to surround the patio edge.

26. $P = 34 + 45 + 62 = 141$
He travels 141 mi roundtrip.

27. $C = \pi d$
$301.5 \approx 3.14 \cdot d$
$301.5 \div 3.14 \approx 3.14d \div 3.14$
$96 \approx d$
The diameter of the rotunda is about 96 ft.

28. Possible answer: Lay the string all the way around the outside of the object and cut it. Then take the string and measure it with a ruler.

29. Possible answer: How many feet of ribbon would be needed to trim the edge of the bulletin board?

30. Subtract twice the length from the perimeter and divide the result by 2.

31. $25\frac{1}{2} \div 9 = \frac{51}{2} \cdot \frac{1}{9} = \frac{17}{2} \cdot \frac{1}{3} = \frac{17}{6} = 2\frac{5}{6}$
Each side of the nonagon is $2\frac{5}{6}$ in.

32. D; 47.1 inches
$C = \pi d$
$C \approx 3.14 \cdot 15$
$C \approx 47.1$
The circumference of the circle is about 47.1 in.

33. 28
$P = 2\ell + 2w$
$P = 2 \cdot 6 + 2 \cdot 8$
$P = 12 + 16$
$P = 28$
The perimeter is 28 ft.

LESSON 2

Think and Discuss

1. Possible answer: The formula for the area of a circle uses the radius of a circle. If the diameter is given, you must first divide the diameter by 2.
2. Possible answer: a clock; estimate the radius of the clock, square that number, and then multiply by 3.14. $(6 \text{ in.})^2 \cdot 3.14 = 113.04 \text{ in}^2$

Exercises

1. $A = \pi r^2$
   $A \approx 3.14 \cdot 5^2$
   $A \approx 3.14 \cdot 25$
   $A \approx 78.5$
   The area of the circle is about 78.5 in^2.
2. $A = \pi r^2$
   $A \approx 3.14 \cdot 8^2$
   $A \approx 3.14 \cdot 64$
   $A \approx 200.96$
   The area of the circle is about 201.0 cm^2.
3. $A = \pi r^2$
   $A \approx 3.14 \cdot 10^2$
   $A \approx 3.14 \cdot 100$
   $A \approx 314$
   The area of the circle is about 314 yd^2.
4. $A = \pi r^2$
   $A \approx 3.14 \cdot 1.1^2$
   $A \approx 3.14 \cdot 1.21$
   $A \approx 3.7994$
   The area of the circle is about 3.8 m^2.
5. $A = \pi r^2$
   $A \approx \frac{22}{7} \cdot 7^2$
   $A \approx \frac{22}{7} \cdot 49$
   $A \approx \frac{22}{1} \cdot 7$
   $A \approx 154$
   The area of the pizza is about 154 in^2.
6. The diameter of the circle is 1.2 cm.
   $A = \pi r^2$
   $A \approx 3.14 \cdot 0.6^2$
   $A \approx 1.1304$
   Half of the circle is shaded, so $1.1304 \div 2 = 0.5652$.
   The area of the shaded part of the circle is about 0.6 cm^2.
7. $A = \pi r^2$
   $A \approx 3.14 \cdot 3^2$
   $A \approx 3.14 \cdot 9$
   $A \approx 28.26$
   The area of the circle is about 28.3 in^2.
8. $A = \pi r^2$
   $A \approx 3.14 \cdot 16^2$
   $A \approx 3.14 \cdot 256$
   $A \approx 803.84$
   The area of the circle is about 803.8 ft^2.
9. $A = \pi r^2$
   $A \approx 3.14 \cdot 3.2^2$
   $A \approx 3.14 \cdot 10.24$
   $A \approx 32.1536$
   The area of the circle is about 32.2 yd^2.
10. $A = \pi r^2$
    $A \approx 3.14 \cdot 7.5^2$
    $A \approx 3.14 \cdot 56.25$
    $A \approx 176.625$
    The area of the circle is about 176.6 cm^2.
11. $A = \pi r^2$
    $A \approx \frac{22}{7} \cdot 14^2$
    $A \approx \frac{22}{7} \cdot 196$
    $A \approx \frac{22}{1} \cdot 28$
    $A \approx 616$
    The area of the pizza is about 616 cm^2.
12. The diameter of the circle measures 3 cm.
    $A = \pi r^2$
    $A \approx 3.14 \cdot 1.5^2$
    $A \approx 7.065$
    A quarter of the circle is shaded, so $7.065 \div 4 = 1.76625$.
    The area of the shaded part of the circle is about 1.8 cm^2.
13. $A = \pi r^2$
    $A \approx 3.14 \cdot 75^2$
    $A \approx 3.14 \cdot 5{,}625$
    $A \approx 17{,}662.5$
    The area of the circle is about 17,662.5 mi^2.
14. $A = \pi r^2$
    $A \approx 3.14 \cdot 4^2$
    $A \approx 3.14 \cdot 16$
    $A \approx 50.24$
    The area of Kay's flower bed is about 50.2 ft^2.
15. $A = \pi r^2$
    $A \approx 3.14 \cdot 3^2$
    $A \approx 3.14 \cdot 9$
    $A \approx 28.26$
    The area of one lid is about 28.3 cm^2.
16. $C = 2\pi r$
    $C \approx 2 \cdot 3.14 \cdot 7$
    $C \approx 43.96$
    The circumference is about 44.0 m.
    $A = \pi r^2$
    $A \approx 3.14 \cdot 7^2$
    $A \approx 3.14 \cdot 49$
    $A \approx 153.86$
    The area is about 153.9 m^2.
17. $C = \pi d$
    $C \approx 3.14 \cdot 18$
    $C \approx 56.52$
    The circumference is about 56.5 in.
    $A = \pi r^2$
    $A \approx 3.14 \cdot 9^2$
    $A \approx 3.14 \cdot 81$
    $A \approx 254.34$
    The area is about 254.3 in^2.

18. $C = \pi d$
$C \approx 3.14 \cdot 24$
$C \approx 75.36$
The circumference is about 75.4 ft.
$A = \pi r^2$
$A \approx 3.14 \cdot 12^2$
$A \approx 3.14 \cdot 144$
$A \approx 452.16$
The area is about 452.2 ft^2.

19. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 6.4$
$C \approx 40.192$
The circumference is about 40.2 cm.
$A = \pi r^2$
$A \approx 3.14 \cdot 6.4^2$
$A \approx 3.14 \cdot 40.96$
$A \approx 128.6144$
The area is about 128.6 cm^2.

20.
$A = \pi r^2$
$113.04 \approx 3.14r^2$
$36 \approx r^2$
$6 \approx r$
The radius is 6 cm.

21.
$A = \pi r^2$
$3.14 \approx 3.14r^2$
$1 \approx r^2$
$1 \approx r$
The radius is 1 ft.

22.
$A = \pi r^2$
$28.26 \approx 3.14r^2$
$9 \approx r^2$
$3 \approx r$
The radius is 3 in.

23. a. The hiker walked 6 miles in any direction. This is equivalent to a circle with a radius of 6.
$A = \pi r^2$
$A \approx 3.14 \cdot 6^2$
$A \approx 3.14 \cdot 36$
$A \approx 113.04$
They would have to search about 113 mi^2.

b. The hiker would have walked 9 miles in any direction, which is a circle with a radius of 9.
$A = \pi r^2$
$A \approx 3.14 \cdot 9^2$
$A \approx 3.14 \cdot 81$
$A \approx 254.34$
They would have to search about 254 mi^2.
$254 - 113 = 141$
This is an additional 141 mi^2.

24. The diameter of the turbine is 187 ft.
$A = \pi r^2$
$A \approx 3.14 \cdot 93.5^2$
$A \approx 3.14 \cdot 8{,}742.25$
$A \approx 27{,}450.665$
The area covered by the turbine when it is rotating is about 27,450.7 ft^2.

25. No; the combined area of the two circles of the same radius is $2\pi r^2$, while the area of a circle with twice the radius is $\pi(2r)^2 = 4\pi r^2$.

26. Possible answer: What is the area that Chang painted, using 3.14 for π?

27. Possible answer: First use the formula for the circumference, $C = 2\pi r$, to solve for the radius, r. Then plug the radius into the formula for the area of a circle, $A = \pi r^2$.

28. The area is multiplied by a factor of n^2. For instance, a circle with a radius of 5 has an area of about 78.5 $units^2$. If the radius is multiplied by 5, then the area is about 1,962.5 $units^2$, which is 5^2 times, or 25 times, as large.

29. A, 3.7 square feet
$A = \pi r^2$
$30 \approx 3.14r^2$
$9.55 \approx r^2$
$3.09 \approx r$
$3.09 - 2 = 1.09$
$A = \pi r^2$
$A \approx 3.14 \cdot 1.09^2$
$A \approx 3.73$
The area of the second circle is 3.7 square feet.

30. No, the 24-in. pizza is actually 4 times the size of the 12-in. pizza. When the diameter is doubled, the area becomes 2^2, or 4, times as large.
12-in. diameter pizza:
$A = \pi r^2$
$A \approx 3.14 \cdot 6^2$
$A \approx 113.04$ in^2
24-in. diameter pizza:
$A = \pi r^2$
$A \approx 3.14 \cdot 12^2$
$A \approx 452.16$ in^2

LESSON 3

Think and Discuss

1. Possible answer: Divide the figure horizontally into two rectangles (with areas 12 in^2 and 16 in^2), or divide the figure vertically into two rectangles (with areas 24 in^2 and 4 in^2).

2. Possible answer: The area will stay the same, 28 in^2, but the perimeter will change. The perimeter of the irregular figure is 24 in., whereas the perimeter of the two rectangles is 16 in. + 20 in. = 36 in.

Exercises

1. 27 full squares + 4 partially-filled squares is about 28 ft^2.

2. 8 full squares + 6 half-filled squares + 4 partially-filled squares is about 14 ft^2.

3. Top rectangle:
$A = \ell w$
$A = 8 \cdot 10$
$A = 80$
Bottom rectangle:
$A = \ell w$
$A = 18 \cdot 8$
$A = 144$
$80 + 144 = 224$
The area of the figure is 224 ft^2.

4. Rectangle:
$A = \ell w$
$A = 12 \cdot 26$
$A = 312$
Half circle:
$A = \frac{1}{2}\pi r^2$
$A \approx \frac{1}{2} \cdot 3.14 \cdot 5^2$
$A \approx \frac{1}{2} \cdot 78.5$
$A \approx 39.25$
$312 + 39.25 = 351.25$
The area of the figure is 351.25 m^2.

5. Rectangle:
$A = \ell w$
$A = 3 \cdot 2$
$A = 6$
Triangle:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 8 \cdot 8$
$A = \frac{1}{2} \cdot 64$
$A = 32$
$6 + 32 = 38$
The area of the figure is 38 ft^2.

6. Rectangle:
$A = \ell w$
$A = 4.5 \cdot 2$
$A = 9$
Two half circles:
$A = 2 \cdot \left(\frac{1}{2}\pi r^2\right)$
$A \approx 2 \cdot \left(\frac{1}{2} \cdot 3.14 \cdot 1^2\right)$
$A \approx 2 \cdot (1.57)$
$A \approx 3.14$
$9 + 3.14 = 12.14$
The area of the figure is 12.14 ft^2.

7. 21 full squares + 4 half-filled squares + 3 partially-filled squares is about 25 ft^2.

8. 22 full squares + 6 partially-filled squares is about 26 ft^2.

9. Rectangle:
$A = \ell w$
$A = 12 \cdot 6$
$A = 72$
Two half circles:
$A = 2 \cdot \left(\frac{1}{2}\pi r^2\right)$
$A \approx 2 \cdot \left(\frac{1}{2} \cdot 3.14 \cdot 2^2\right)$
$A \approx 2 \cdot (6.28)$
$A \approx 12.56$
$72 + 12.56 = 84.56$
The area of the figure is 84.56 m^2.

10. Rectangle 1:
$A = \ell w$
$A = 8 \cdot 10$
$A = 80$
Rectangle 2:
$A = \ell w$
$A = 4 \cdot 7$
$A = 28$
Rectangle 3:
$A = \ell w$
$A = 3 \cdot 3$
$A = 9$
$80 + 28 + 9 = 117$
The area of the figure is 117 ft^2.

11. Rectangle:
$A = \ell w$
$A = 9 \cdot 4$
$A = 36$
Triangle 1:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 4 \cdot 2$
$A = \frac{1}{2} \cdot 8$
$A = 4$
Triangle 2:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 4 \cdot 3$
$A = \frac{1}{2} \cdot 12$
$A = 6$
$36 + 4 + 6 = 46$
The area of the figure is 46 cm^2.

12. Trapezoid:
$A = bh$
$A = 20 \cdot 6$
$A = 120$
Half circle:
$A = \frac{1}{2}\pi r^2$
$A \approx \frac{1}{2} \cdot 3.14 \cdot 10^2$
$A \approx 157$
$120 + 157 = 277$
The area of the figure is 277 m^2.

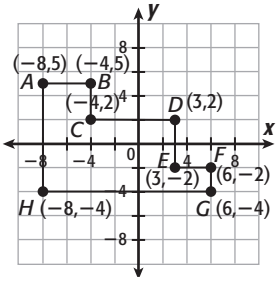
13. Top rectangle:
$A = \ell w$
$A = 3 \cdot 4$
$A = 12$
Bottom rectangle:
$A = \ell w$
$A = 9 \cdot 2$
$A = 18$
$12 + 18 = 30$
The area of the figure is 30 ft^2.
$P = 2 + 3 + 4 + 3 + 4 + 3 + 2 + 9 = 30$
The perimeter of the figure is 30 ft.

14. Square:
$A = \ell w$
$A = 5 \cdot 5$
$A = 25$
Triangle:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 3 \cdot 4$
$A = \frac{1}{2} \cdot 12$
$A = 6$
$25 + 6 = 31$
The area of the figure is 31 m^2.
$P = 5 + 5 + 4 + 5 + 2 + 5 = 26$
The perimeter of the figure is 26 m.

15. Rectangle:
$A = \ell w$
$A = 18 \cdot 12$
$A = 216$
Half circle:
$A = \frac{1}{2}\pi r^2$
$A \approx \frac{1}{2} \cdot 3.14 \cdot 5^2$
$A \approx \frac{1}{2} \cdot 78.5$
$A \approx 39.25$
$216 + 39.25 = 255.25$
The area of the figure is 255.25 m^2.
$C = \pi d$
$C \approx 3.14 \cdot 10$
$C \approx 31.4$
Half circle:
$C \approx 31.4 \div 2 = 15.7$
$P = 12 + 18 + 12 + 15.7 + 8 = 65.7$
The perimeter of the figure is 65.7 m.

16. No, rearranging the composite figure does not change its perimeter or area.

17.
$$P = s + s + s + s + s$$
$$44 = x + x + x + 7 + 7$$
$$44 = 3x + 14$$
$$44 - 14 = 3x + 14 - 14$$
$$30 = 3x$$
$$10 \text{ ft} = x$$

18.


Rectangle 1:
$A = \ell w$
$A = 4 \cdot 9$
$A = 36$
Rectangle 2:
$A = \ell w$
$A = 7 \cdot 6$
$A = 42$
Rectangle 3:
$A = \ell w$
$A = 3 \cdot 2$
$A = 6$
$36 + 42 + 6 = 84$
The area of the figure is 84 $units^2$.
$P = 9 + 4 + 3 + 7 + 4 + 3 + 2 + 14 = 46$
The perimeter of the figure is 46 units.

19. A; 5 m
Draw a Picture and Guess and Check
Area of total figure = 32.5; area of triangle = 7.5
$32.5 - 7.5 = 25$, area of square
$A = s^2$
$25 = s^2$
$5 \text{ m} = s$

20. Draw a vertical line to divide the figure into a rectangle (area 30 in^2) and triangle (area 27 in^2).
The total area is $30 + 27 = 57$ in^2.

21. Find the area of the entire rectangle. Then subtract the area of the two half circles.
Rectangle:
$A = \ell w$
$A = 10 \cdot 8$
$A = 80$
Two half circles:
$A = 2 \cdot \left(\frac{1}{2}\pi r^2\right)$
$A \approx 2 \cdot \left(\frac{1}{2} \cdot 3.14 \cdot 4^2\right)$
$A \approx 2 \cdot (25.12)$
$A \approx 50.24$
$80 - 50.24 = 29.76$
The area of the figure is 29.76 cm^2.
$C = \pi d$
$C \approx 3.14 \cdot 8$
$C \approx 25.12$
Half circle:
$C \approx 31.4 \div 2 = 12.56$
$P = 10 + 12.56 + 10 + 12.56 = 45.12$
The perimeter of the figure is 45.12 cm.

22. B; 24 in.
If the area of one triangle is 6 in^2, use the formula for the area of a triangle to find the possible base and height lengths.
$A = \frac{1}{2}bh$
$6 = \frac{1}{2}bh$
$12 = bh$
Possible *bh* combinations that equal 12:
1×12
2×6
3×4
Try these combinations as perimeters.
1×12 combination: $P = 1 + 12 + 1 + 12 = 26$ in.
2×6 combination: $P = 2 + 6 + 2 + 6 = 16$ in.
3×4 combination: $P = 3 + 4 + 3 + 4 = 14$ in.
24 inches is the only choice that cannot be the perimeter of this rectangle.

23. 18 full squares + 4 half squares = 20 full squares, or patches
20 patches × 12 carrots per patch = 240 carrots
She can expect to grow 240 carrots in her garden.

READY TO GO ON?

1. $P = 10.2 + 3.0 + 10.2 + 3.0 = 26.4$
The perimeter is 26.4 m.

2. $C = \pi d$
$94 \approx 3.14 \cdot d$
$29.936 \approx d$
The diameter is about 30 cm.

3. $P = 6.5 + 22 + 6.5 + 22 = 57$
The perimeter is 57 cm.

4. $P = 12 + 5 + 9 + 6 = 32$
The perimeter is 32 in.

5. $P = 50 + 30 + 40 = 120$
The perimeter is 120 ft.

6. $A = \pi r^2$
$A \approx 3.14 \cdot 14^2$
$A \approx 615.44 \approx 615.4$ OR
$A \approx \frac{22}{7} \cdot 14^2$
$A \approx \frac{22}{7} \cdot \frac{196}{1}$
$A \approx \frac{22}{1} \cdot \frac{28}{1} \approx 616$
The area of the circle is 615.4 ft^2 or 616 ft^2.

7. $A = \pi r^2$
$A \approx \frac{22}{7} \cdot \left(\frac{35}{4}\right)^2$
$A \approx \frac{22}{7} \cdot \frac{1{,}225}{16}$
$A \approx \frac{11}{1} \cdot \frac{175}{8}$
$A \approx \frac{1{,}925}{8} \approx 240\frac{5}{8}$
The area of the clock face is 240 in^2 (if using 3.14 for π) or 241 in^2 (if using $\frac{22}{7}$ for π).

8. $A = \pi r^2$
$28.26 \approx 3.14r^2$
$9 \approx r^2$
$3 \approx r$
The radius is 3 mm.

9. $A = \pi r^2$
$153.86 \approx 3.14r^2$
$49 \approx r^2$
$7 \approx r$
The radius is 7 yd.

10. $A = \pi r^2$
$50.24 \approx 3.14r^2$
$16 \approx r^2$
$4 \approx r$
The radius is 4 in.

11. Rectangle 1:
$A = \ell w$
$A = 21 \cdot 15$
$A = 315$
Rectangle 2:
$A = \ell w$
$A = 15 \cdot 6$
$A = 90$
$315 + 90 = 405$
The area of the figure is 405 cm^2.

12. Rectangle:
$A = \ell w$
$A = 13 \cdot 7$
$A = 91$
Triangle 1:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 4 \cdot 3$
$A = 6$
Triangle 2:
$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 7 \cdot 3$
$A = 11.5$
$91 + 6 + 10.5 = 107.5$
The area of the figure is 107.5 ft^2.

13. Rectangle:
$A = \ell w$
$A = 9 \cdot 11$
$A = 99$
Two half circles:
$A = 2 \cdot \left(\frac{1}{2}\pi r^2\right)$
$A \approx 2 \cdot \left(\frac{1}{2} \cdot 3.14 \cdot 5.5^2\right)$
$A \approx 2 \cdot (47.4925)$
$A \approx 94.985$
$99 + 94.985 = 193.985$
The area of the figure is 194 yd^2.

LESSON 4

Think and Discuss

1. Possible answer: Prisms and pyramids are polyhedrons, so all of their faces are polygons. A prism has two parallel, congruent bases, and a pyramid has one base.

2. Possible answer: Both have two parallel, congruent bases. The bases of cylinders are circles, and the bases of prisms are polygons. The bases of cylinders are connected by a curved surface, and the bases of prisms are connected by polygonal faces.

Exercises

1. There is one base, and it is a pentagon.
The other faces are triangles.
The figure is a pentagonal pyramid.

2. There are two bases, and they are octagons.
The other faces are rectangles.
The figure is a octagonal prism.

3. There are two bases, and they are triangles.
The other faces are rectangles.
The figure is a triangular prism.

4. The figure is not a polyhedron.
The figure is a cone.

5. The figure is a polyhedron.
The figure is a hexagonal pyramid.

6. The figure is not a polyhedron.
The figure is a sphere.

7. There is one base, and it is a triangle.
The other faces are triangles.
The figure is a triangular pyramid.

8. There are two bases, and they are rectangles.
The other faces are rectangles.
The figure is a rectangular prism.

9. There is one base, and it is a hexagon.
The other faces are triangles.
The figure is a hexagonal pyramid.

10. The figure is a polyhedron.
The figure is an octagonal prism.

11. The figure is not a polyhedron.
The figure is a cylinder.

12. The figure is a polyhedron.
The figure is a triangular pyramid.

13. The figure is made up of two parallel, congruent square bases and four other polygonal faces.
Square prism

14. The figure is made up of two parallel, congruent circular bases and one curved surface.
Cylinder

15. The figure is made up of one triangular base and three other triangular faces.
Triangular pyramid

16. By definition, all points or a surface that are equidistance from a given point form a sphere.

17. The figure is made up of two parallel, congruent bases.
Possible answer: cylinder, rectangular prism

18. The figure is made up of one base.
Possible answer: cone, rectangular pyramid

19. Rectangular pyramid

20. Possible answer: cylinders, rectangular prism

21. Cylinder

22. Possible answer: The Unisphere is not a true sphere because it has gaps in its surface.

23. A; Rectangular prism **24.** G; Pyramid

LESSON 5

Think and Discuss

1. Possible answer: A cubic unit is the unit used when finding volume; cubic yards, or yd^3.

2. Possible answer: Both are measured in cubic units, and both are found by multiplying the area of the base times the height. The areas of their bases are found differently: One is the area of a circle and the other is the area of a polygon.

Exercises

1. $V = Bh$
$= (8 \cdot 6)(5)$
$= 240 \text{ in}^3$
The volume is 240 in^3.

2. $V = Bh$
$= \left(\frac{1}{2} \cdot 10 \cdot 5\right)(20)$
$= 500 \text{ mm}^3$
The volume is 500 mm^3.

3. $V = Bh$
$= (2.25 \cdot 0.5)(3.5)$
$= 3.9375 \text{ in}^3$
The volume is 3.9375 in^3.

4. $V \approx \pi r^2 h$
$\approx \pi(2)^2(6)$
$\approx \pi(4)(6)$
$\approx 75.4 \text{ cm}^3$
The volume of the can is about 75.4 cm^3.

5. $V = Bh + \pi r^2 h$
$\approx (6)(3)(7) + (3.14)(2)^2(5)$
$\approx 126 + 62.8$
≈ 188.8
The volume of the composite figure is about 188.8 m^3.

6. $V = Bh + Bh$
$= (8)(5)(4) + \frac{1}{2}(3)(8)(5)$
$= 160 + 60$
$= 220$
The volume of the composite figure is 220 ft^3.

7. $V = Bh$
$= \left(\frac{1}{2} \cdot 4 \cdot 8\right)(12)$
$= 192 \text{ ft}^3$
The volume is 192 ft^3.

8. $V = Bh$
$= (20 \cdot 15)(9)$
$= 2{,}700 \text{ cm}^3$
The volume is 2,700 cm^3.

9. $V = Bh$
$= (6 \cdot 0.4)(5.6)$
$= 13.44 \text{ in.}^3$
The volume is 13.44 in^3.

10. $V \approx \pi r^2 h$
$\approx \pi(2)^2(28)$
$\approx \pi(4)(28)$
$\approx 351.7 \text{ cm}^3$
The volume of the paper towel roll is about 351.7 cm^3.

11. $V = Bh + \pi r^2 h$
$= (5)(5)(5) + \frac{1}{2}(6)(5)(5)$
$= 125 + 75$
$= 200$
The volume of the composite figure is 200 in^3.

12. $V = Bh + \pi r^2 h$
$\approx (8)(6)(3) + (3.14)(2)^2(5)$
$\approx 144 + 62.8$
≈ 206.8
The volume of the composite figure is about 206.8 cm^3.

13. First find the missing leg of the triangle.
$a^2 + b^2 = c^2$
$6^2 + b^2 = 10^2$
$36 + b^2 = 100$
$-36 \quad -36$
$b^2 = 64$
$b = 8$
The length of the missing leg is 8 m. The area of each triangular base is $\frac{1}{2} \cdot 6 \cdot 8 = 24$.
Find the volume of the prism.
$V = Bh$
$= \left(\frac{1}{2} \cdot 6 \cdot 8\right)(12)$
$= 288\ m^3$

14. $V \approx \pi r^2 h$
$= (3.14)(1.5)^2(4)$
$= 28.26$
The candle is 28.26 in^3.
$(26.28)(16.38) = 462.90$
The candle is 462.90 cm^3.

15. $V = Bh$
$= \left(\frac{1}{2} \cdot 4.5 \cdot 3.5\right)(6)$
$= 47.25\ ft^3$
There are 47.25 ft^3 of space in the tent.

16. Possible answer: The volumes are equal because a cylinder with a 3-inch diameter has a 1.5-inch radius.

17. Possible answer: For both, the volume is the area of the base times the height; the formulas for the base areas are different.

18. Find the volume of the outer cylinder.
$V \approx \pi r^2 h$
$\approx \pi(4.2)^2(15)$
$\approx 3(17.64)(15)$
$\approx 830.8\ cm^3$
Find the volume of the inner cylinder.
$V \approx \pi r^2 h$
$\approx \pi(3)^2(15)$
$\approx 3.14(9)(15)$
$\approx 423.9\ cm^3$
Subtract the two volumes.
$830.8 - 423.9 \approx 406.9\ cm^3$

19. B; $V = Bh$
$= \left(\frac{1}{2} \cdot 7 \cdot 4\right)(10)$
$= 140\ in^3$
The volume is 140 ft^3.

20. F; I and II
I: $V = (3 \cdot 8)(3)$
$\approx 72\ in.^3$
II: $V = \left(\frac{1}{2} \cdot 3 \cdot 3\right)(16)$
$\approx 72\ in.^3$
III: $V \approx \pi r^2 h$
$\approx \pi(2)^2(7)$
$\approx \pi(4)(7)$
$\approx 87.9\ in.^3$

LESSON 6

Think and Discuss

1. Possible answer: Find the sum of the areas of the five faces, including only one base.

Exercises

1. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 9 \cdot 7) + (2 \cdot 9 \cdot 5) + (2 \cdot 7 \cdot 5)$
$S = 126 + 90 + 70$
$S = 286$
The surface area of the prism is 286 ft^2.

2. $S = 2\left(\frac{1}{2}\right)bh + bh + bh + b$
$= 2\left(\frac{1}{2}\right)(6)(10) + (10)(2.5) + (8)(2.5)$
$+ (8)(2.5)$
$= 60 + 25 + 20 + 20$
$= 125$
The surface area of the prism is 125 cm^2.

3. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 3^2) + (2 \cdot 3.14 \cdot 3 \cdot 10)$
$S \approx 56.52 + 188.4$
$S \approx 244.92$
$S \approx 244.9$
The surface area of the cylinder is 244.9 m^2.

4. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 15^2) + (2 \cdot 3.14 \cdot 15 \cdot 5)$
$S \approx 1{,}413 + 471$
$S \approx 1{,}884.0$
The surface area of the cylinder is 1,884.0 in^2.

5. $S = bh + 2bh + 2bh + \frac{1}{4}\pi r^2 + \frac{1}{4}2\pi rw$
$\approx (8 + 8)(16) + 2(8)(8) + 2(16)(8)$
$+ 2 \cdot \frac{1}{4}(3.14)(8)^2 + \frac{1}{4}2(3.14)(8)(16)$
$\approx 256 + 128 + 256 + 100.48 + 200.96$
≈ 941
The surface area of the breadbox is about 941 in^2.
To calculate the reasonableness of the answer, calculate the surface area of a prism breadbox.
$S = 2bh + 2bh + 2bh$
$= 2(16)(16) + 2(8)(16) + 2(8)(16)$
$= 512 + 256 + 256$
$= 1{,}024$
The surface area of a prism breadbox would be 1,024 cm^2. Therefore the answer is reasonable.

6. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 20 \cdot 16) + (2 \cdot 20 \cdot 4) + (2 \cdot 16 \cdot 4)$
$S = 640 + 160 + 128$
$S = 928$
The surface area of the prism is 928 $in.^2$

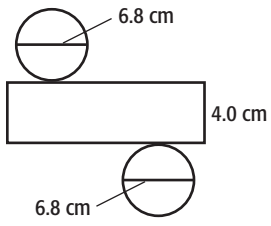
7. $S = 2 \cdot \frac{1}{2}bh + 2bh + bh$
$= 2 \cdot \frac{1}{2}(8)(3) + 2(5)(6) + (8)(6)$
$= 24 + 60 + 48$
$= 132$
The surface area of the prism is 132 yd^2.

8. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 6^2) + (2 \cdot 3.14 \cdot 6 \cdot 15)$
$S \approx 226.08 + 565.2$
$S \approx 791.28$
$S \approx 791.3$
The surface area of the cylinder is 791.3 in^2.

9. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 1.5^2) + (2 \cdot 3.14 \cdot 1.5 \cdot 18.5)$
$S \approx 14.13 + 174.27$
$S \approx 188.4$
The surface area of the cylinder is 188.4 cm^2.

10. $S = 4bh + bh + 2bh + 2 \cdot \frac{1}{2} bh$
$= 4(4)(12) + (4)(4) + 2(2\sqrt{2})(4)$
$+ 2 \cdot \frac{1}{2} (4)(2)$
$\approx 192 + 16 + 23 + 8$
≈ 239
The surface area of the milk carton is about 239 in^2.
To check the surface area for reasonableness, find the area of a rectangular prism.
$S = 4bh + 2bh$
$= 4(12)(4) + 2(4)(4)$
$= 192 + 32$
$= 224$
The area of a similar rectangular prism is 224 in^2. Therefore the answer is reasonable.

11. a.



b. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 3.4^2) + (2 \cdot 3.14 \cdot 3.4 \cdot 4)$
$S \approx 72.5968 + 85.408$
$S \approx 158.0048$
$S \approx 158.0$
About 158.0 cm^2 of metal are used to make each can.

c. The label fits the area of the lateral surface, $2\pi rh$. From the steps in part b, the lateral surface area is about 85.408. So, about 85.4 cm^2 of paper are needed for each label.

12. a. Box 1: $V = \ell wh$
$= (3)(8)(9)$
$= 216$ in^3
Box 2: $V = \ell wh$
$= (4)(6)(9)$
$= 216$ in^3
Box 3: $V = \ell wh$
$= (6)(6)(6)$
$= 216$ in^3
All the boxes have a volume of 216 in^3.

b. Box 1: $S = 2bh + 2bh + 2bh$
$= 2(3)(8) + 2(3)(9) + 2(8)(9)$
$= 48 + 54 + 144$
$= 246$ in^2
Box 2: $S = 2bh + 2bh + 2bh$
$= 2(4)(6) + 2(4)(9) + 2(6)(9)$
$= 48 + 72 + 108$
$= 228$ in^2
Box 3: $S = 2bh + 2bh + 2bh$
$= 6(6)(6)$
$= 216$ in^2
Box 3 requires the least amount of material to wrap.

c. The edge lengths must be equal to give the least surface area.

13. $C = 2\pi r$
$20\pi = 2\pi r$
$10 = 2r$
The radius is 10 cm.
$S = 2\pi r^2 + C\left(\frac{1}{2}r\right)$
$= 2\pi(10)^2 + 20\pi \left(\frac{1}{2}(10)\right)$
$= 200\pi + 100\pi$
$= 300\pi$
The surface area of the cylinder is 300π cm^2.

14. Possible answer: Because a cube has 6 congruent square faces, divide 512 by 6 to find the surface area of each face. Take the square root of the area of one face to get the length of each side.

15. Find the surface area of the large rectangular prism.
$S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 25 \cdot 20) + (2 \cdot 25 \cdot 12) + (2 \cdot 20 \cdot 12)$
$S = 1{,}000 + 600 + 480$
$S = 2{,}080$
Subtract off the 2 square openings.
$2{,}080 - (2 \cdot 8 \cdot 8) = 1{,}952$
Find the surface area of the hole.
$S = 2\ell w + 2wh$
$S = (2 \cdot 8 \cdot 20) + (2 \cdot 8 \cdot 20)$
$S = 320 + 320$
$S = 640$
Find the sum of the two surface areas.
$1{,}952 + 640 = 2{,}592$
The total surface area is 2,592 cm^2.

16. C; 708 in^2

17. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 5^2) + (2 \cdot 3.14 \cdot 5 \cdot 15)$
$S \approx 157 + 471$
$S \approx 628$
The surface area of the cylinder is 628 cm^2.

READY TO GO ON?

1. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 15 \cdot 3) + (2 \cdot 15 \cdot 8) + (2 \cdot 3 \cdot 8)$
$S = 90 + 240 + 48$
$S = 378$
The surface area of the prism is 378 in^2.

2. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 2 \cdot 5) + (2 \cdot 2 \cdot 2) + (2 \cdot 5 \cdot 2)$
$S = 20 + 8 + 20$
$S = 48$
The surface area of the prism is 48 cm^2.

3. $S = 2\pi r^2 + 2\pi rh$
$S \approx 2 \cdot 3.14 \cdot 7^2 + 2 \cdot 3.14 \cdot 7 \cdot 15$
$S \approx 307.72 + 659.4$
$S \approx 967.1$
The surface area of the cylinder is 967.1 in^2.

4. $S = 2bh + 2bh + bh + 2 \cdot \frac{1}{2}\pi r^2 + \frac{1}{2} \cdot 2\pi r\ell$
$= 2(0.5)(6) + 2(0.5)(9) + (6)(9)$
$+ 2 \cdot \frac{1}{2}(3.14)(3)^2 + \frac{1}{2} \cdot 2(3.14)(3)(9)$
$= 6 + 9 + 54 + 28.26 + 84.78$
$= 182.04$
The surface area of the composite figure is about 182.0 m^2.

5. The figure is not a polyhedron.
The figure is a cone.

6. The figure is a polyhedron.
The figure is a hexagonal pyramid.

7. The figure is a polyhedron.
The figure is a triangular pyramid.

8. $V = \ell wh$
$V = 6 \cdot 2 \cdot 3$
$V = 36$
The volume is 36 ft^3.

9. $V = \pi r^2 h$
The radius of the cylinder is 2.6 m, and the height is 2.3 m.
$V \approx 3.14 \cdot 2.6^2 \cdot 2.3$
$V \approx 48.8$
The volume is about 48.8 cm^3.

10. $V = Bh + \pi r^2 h$
$\approx (12)(5)(3) + (3.14)(3)^2(8)$
$\approx 180 + 226.08$
≈ 406.1
The volume of the composite figure is about 406.1 in^3.

11. $V = Bh + Bh$
$= (2)(4)(3) + \frac{1}{2}(4)(3)(2)$
$= 24 + 12$
$= 36$
The volume of the composite figure is 36 cm^3.

12. $V \approx 3{,}785 \cdot 4^3$
$V \approx 3{,}785 \cdot 64$
$V \approx 242{,}240$
The volume of the larger container is 242,240 in^3.
$3{,}785 \div 231 = 16.4$
The small container can hold 16.4 gallons.
$242{,}240 \div 231 = 1{,}048.7$
The larger container can hold 1,048.7 gallons.
$1{,}048.7 - 16.4 = 1{,}032.3$
The larger container can hold about 1,032 more gallons than the smaller container.

STUDY GUIDE: REVIEW

1. cylinder **2.** surface area

3. polyhedron **4.** cone

5. $P = 12 + 24 + 15 + 32$
$P = 83$
The perimeter of the trapezoid is 83 m.

6. $P = 2\ell + 2w$
$P = (2 \cdot 24.9) + (2 \cdot 15.8)$
$P = 49.8 + 31.6$
$P = 81.4$
The perimeter of the rectangle is 81.4 cm.

7. $C = \pi d$
$C \approx 3.14 \cdot 13$
$C \approx 40.82$
The circumference of the circle is about 40.8 ft.

8. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 7.8$
$C \approx 48.984$
The circumference of the circle is about 49.0 in.

9. $A = \pi r^2$
$A \approx 3.14 \cdot 3.4^2$
$A \approx 3.14 \cdot 11.56$
$A \approx 36.3$
The area of the circle is 36.3 m^2.

10. $A = \pi r^2$
$A \approx 3.14 \cdot 8.5^2$
$A \approx 3.14 \cdot 72.25$
$A \approx 226.865$
The area of the circle is 226.9 ft^2.

11. $A = \pi r^2$
$A \approx 3.14 \cdot 92$
$A \approx 3.14 \cdot 81$
$A \approx 254.34$
The area of the circle is 254.34 in^2.

12. Area of rectangle:
$A = \ell w$
$A = 7 \cdot 3.5$
$A = 24.5$
Area of half circle:
$A = \frac{1}{2}\pi r^2$
$A \approx \frac{1}{2} \cdot 3.14 \cdot 2.5^2$
$A \approx 9.8125$
$24.5 + 9.8125 = 34.3125$
The area of the figure is 34.31 ft^2.

13. Area of rectangle 1:
$A = \ell w$
$A = 2 \cdot 6$
$A = 12$
Area of rectangle 2:
$A = \ell w$
$A = 3 \cdot 1$
$A = 3$
Area of rectangle 3:
$A = \ell w$
$A = 2 \cdot 3$
$A = 6$
$12 + 3 + 6 = 21$
The area of the figure is 21 m^2.

14. cylinder **15.** rectangular pyramid

16. triangular prism **17.** cone

18. $V = Bh$
$V = \left(\frac{1}{2} \cdot 8 \cdot 7\right) \cdot 13$
$V = 28 \cdot 13$
$V = 364$
The volume of the triangular prism is 364 cm^3.

19. $V = \pi r^2 h$
$V \approx 3.14 \cdot 1.8^2 \cdot 11$
$V \approx 111.9\ ft^3$

20. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 5 \cdot 10) + (2 \cdot 5 \cdot 5) + (2 \cdot 10 \cdot 5)$
$S = 100 + 50 + 100$
$S = 250$
The surface area of the prism is 250 m^2.

21. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 8 \cdot 1) + (2 \cdot 8 \cdot 1) + (2 \cdot 1 \cdot 1)$
$S = 16 + 16 + 2$
$S = 34$
The surface area of the prism is 34 cm^2.

22. $S = 2\pi r^2 + 2\pi rh$
$S \approx (2 \cdot 3.14 \cdot 2.4^2) + (2 \cdot 3.14 \cdot 2.4 \cdot 15)$
$S \approx 36.1728 + 226.08$
$S \approx 262.2528$
$S \approx 262.3$
The surface area of the cylinder is about 262.3 cm^2.

23. $S = 2\pi r^2 + 2\pi rh$
$\approx (2 \cdot 3.14 \cdot 8^2) + (2 \cdot 3.14 \cdot 8 \cdot 8)$
$\approx 401.92 + 401.92$
$\approx 803.8\ ft^2$

CHAPTER TEST

1. The figure is not a polyhedron.
The figure is a cone.

2. The figure is a polyhedron.
The figure is a triangular prism.

3. The figure is a polyhedron.
The figure is a hexagonal pyramid.

4. $V = \ell wh$
$V = 24 \cdot 15 \cdot 13$
$V = 4{,}680.0$
The volume is 4,680.0 in^3.

5. $V = \pi r^2 h$
$V \approx 3.14 \cdot 72 \cdot 8.4$
$V \approx 1{,}292.4$
The surface area of the cylinder is about 1,292.4 m^3.

6. $V = Bh$
$B = \frac{1}{2} \cdot 4.2 \cdot 3.9 = 8.19\ mm^2$
$V = 8.19 \cdot 6.7$
$V = 54.9$
The volume is 54.9 mm^3.

7. $P = 10.5 + 6.3 + 17.2 + 9.1$
$P = 43.1$
The perimeter of the trapezoid is 43.1 in.

8. $A = bh$
$A = 13.6 \cdot 8.7$
$A = 118.32$
The area of the parallelogram is 118.32 ft^2.

9. Area of rectangle 1:
$A = \ell w$
$A = 18 \cdot 7$
$A = 126$
Area of rectangle 2:
$A = \ell w$
$A = 6 \cdot 5$
$A = 30$
$126 + 30 = 156$
The area of the figure is 156 m^2.

10. $A = \frac{1}{2}h(b_1 + b_2)$
$A = \frac{1}{2} \cdot 4\frac{1}{4}\left(2\frac{1}{2} + 6\right)$
$A = \frac{1}{2} \cdot 4\frac{1}{4}\left(8\frac{1}{2}\right)$
$A = 18\frac{1}{16}$
The area of the trapezoid is $18\frac{1}{16}$ mi^2 or 18.0625 mi^2.

11. $C = 2\pi r$
$C \approx 2 \cdot 3.14 \cdot 5\frac{1}{2}$
$C \approx 34.54$
The circumference of the circle is about 34.5 ft.

12. $A = \pi r^2$
$A \approx 3.14 \cdot \left(5\frac{1}{2}\right)^2$
$A \approx 3.14 \cdot 30\frac{1}{4}$
$A \approx 94.985$
The area of the circle is about 95.0 ft^2.

13. $S = 2\ell w + 2\ell h + 2wh$
$S = (2 \cdot 19 \cdot 13) + (2 \cdot 19 \cdot 8) + (2 \cdot 13 \cdot 8)$
$S = 494 + 304 + 208$
$S = 1{,}006$
The surface area of the prism is 1,006 in^2.

14. $S = 2\pi r^2 + 2\pi rh$
$S = (2 \cdot 3.14 \cdot 5.5^2) + (2 \cdot 3.14 \cdot 5.5 \cdot 6.8)$
$S = 189.97 + 234.872$
$S = 424.842$
The surface area of the cylinder is about 424.8 cm^2.

15. $S = 2\pi rh + 2bh + 2bh + 2bh$
$\approx (2 \cdot 3.14 \cdot 1 \cdot 1) + (2 \cdot 2 \cdot 3)$
$+ (2 \cdot 2 \cdot 7) + (2 \cdot 3 \cdot 7)$
$\approx 6.28 + 12 + 28 + 42$
$\approx 88.3\ ft^2$