State whether each sentence is *true* or *false*. If *false*, replace the underlined term to make a true sentence.

1. Euclidean geometry deals with a system of points, great circles (lines), and spheres (planes).

   SOLUTION:
   false, Spherical geometry

   ANSWER:
   false, Spherical geometry

2. Similar solids have exactly the same shape, but not necessarily the same size.

   SOLUTION:
   true

   ANSWER:
   true

3. A right solid has an axis that is also an altitude.

   SOLUTION:
   false, right cone

   ANSWER:
   false, right cone

4. The isometric view is when an object is viewed from a corner.

   SOLUTION:
   true

   ANSWER:
   true

5. The perpendicular distance from the base of a geometric figure to the opposite vertex, parallel side, or parallel surface is the altitude.

   SOLUTION:
   true

   ANSWER:
   true

6. Rotation symmetry is also called mirror symmetry.

   SOLUTION:
   false, reflection

   ANSWER:
   false, reflection

7. The intersection of two adjacent lateral faces is the <u>lateral edge</u>.

   SOLUTION:
   true

   ANSWER:
   true

8. <u>Euclidean geometry</u> refers to geometrical systems that are not in accordance with the Parallel Postulate.

   SOLUTION:
   false, Non-Euclidean geometry

   ANSWER:
   false, Non-Euclidean geometry

9. A <u>composite solid</u> is a three-dimensional figure that is composed of simpler figures.

   SOLUTION:
   true

   ANSWER:
   true

10. The <u>slant height</u> is the height of each lateral face of a pyramid or cone.

    SOLUTION:
    true

    ANSWER:
    true

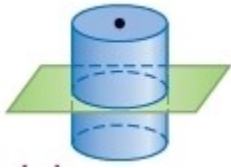   **Describe each cross section.**

11.

    SOLUTION:
    A vertical plane containing the vertex of the cone will cut the prism into two parts with a cross section of a triangle.
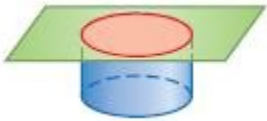

    ANSWER:
    triangle

12.

SOLUTION:

The base of the cylinder is a circle. So, a plane parallel to the base will give a cross section of a circle.

ANSWER:

circle

13. **CAKE** The cake shown is cut in half vertically. Describe the cross section of the cake.

SOLUTION:

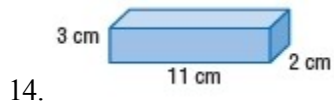A vertical plane will cut the cake into two parts with a cross section of a rectangle.

ANSWER:

rectangle

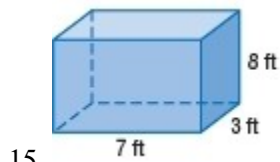**Find the lateral area and surface area of each prism. Round to the nearest tenth if necessary.**

14.

SOLUTION:

$L = Ph$
$= 2(2+11)(3)$
$= 26(3)$
$= 78$

$S = Ph + 2B$
$= 2(2+11)(3) + 2(2)(11)$
$= 78 + 44$
$= 122$

ANSWER:

78 cm^2 ; 122 cm^2

15.

SOLUTION:

$L = Ph$
$= 2(3+7)(8)$
$= 20(8)$
$= 160$

$S = Ph + 2B$
$= 2(3+7)(8) + 2(3)(7)$
$= 160 + 42$
$= 202$

ANSWER:

160 ft^2 ; 202 ft^2

Study Guide and Review

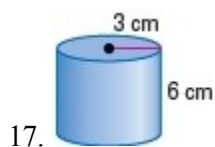**Find the lateral area and surface area of each cylinder. Round to the nearest tenth.**

16.

SOLUTION:

$L = 2\pi rh$

$\quad = 2\pi(4)(5)$

$\quad = 40\pi$
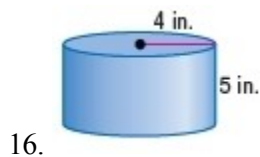
$\quad \approx 125.7$

$S = 2\pi rh + 2B$

$\quad = 2\pi(4)(5) + 2\pi(4)^2$

$\quad = 40\pi + 32\pi$

$\quad = 72\pi$

$\quad \approx 226.2$

ANSWER:

125.7 in^2 ; 226.2 in^2

17.

SOLUTION:

$L = 2\pi rh$

$\quad = 2\pi(3)(6)$

$\quad = 36\pi$

$\quad \approx 113.1$

$S = 2\pi rh + 2B$

$\quad = 2\pi(3)(6) + 2\pi(3)^2$

$\quad = 36\pi + 18\pi$

$\quad = 54\pi$

$\quad \approx 169.6$

ANSWER:

113.1 cm^2 ; 169.6 cm^2

Find the lateral area and the surface area of each regular pyramid. Round to the nearest tenth.

18.

SOLUTION:

$$L = \tfrac{1}{2}Pl$$

$$= \tfrac{1}{2}[(4)(3)](6)$$

$$= 36$$
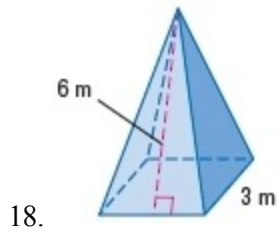
$$S = L + B$$

$$= \tfrac{1}{2}Pl + s^2$$

$$= \tfrac{1}{2}[(4)(3)](6) + 3^2$$

$$= 36 + 9$$

$$= 45$$

ANSWER:

$36\,\text{m}^2 ; 45\,\text{m}^2$
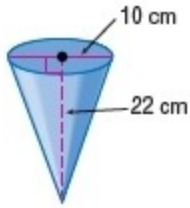
19.

SOLUTION:

Use the Pythagorean Theorem to find the slant height.

$$a^2 + b^2 = c^2$$
$$5^2 + 22^2 = c^2$$
$$25 + 484 = c^2$$
$$\sqrt{509} = c$$

Find the lateral and surface area.

$$L = \pi r l$$
$$= \pi(5)\left(\sqrt{509}\right)$$
$$\approx 354.4$$

$$S = L + B$$
$$= \pi r l + \pi r^2$$
$$= \pi(5)\left(\sqrt{509}\right) + \pi(5)^2$$
$$\approx 432.9$$

ANSWER:

354.4 cm^2 ; 432.9 cm^2

20. The volume of a cylinder is 770 cm^3. It has a height of 5 cm. Find its radius.

    SOLUTION:

    $$\pi r^2 h = V$$
    $$\pi r^2 (5) = 770$$
    $$\pi r^2 = 154$$
    $$r^2 = \frac{154}{\pi}$$
    $$r \approx 7 \text{ cm}$$

    ANSWER:

    7 cm

21. Find the volume of the triangular prism.
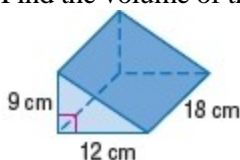
    SOLUTION:

    $$V = Bh$$
    $$= \frac{1}{2}(12)(9) \cdot 18$$
    $$= 54 \cdot 18$$
    $$= 972$$

    ANSWER:

    972 cm^3

22. **TRAILERS** A semi-truck trailer is basically a rectangular prism. A typical height for the inside of these trailers is 108 inches. If the trailer is 8 feet wide and 20 feet long, what is the volume of the trailer?

    SOLUTION:

    $$V = Bh$$
    $$= (20)(8)(9)$$
    $$= 1440$$

    ANSWER:

    1440 ft^3

23. Find the volume of a cone that has a radius of 1 cm and a height of 3.4 cm.

SOLUTION:

The volume of a circular cone is $V = \dfrac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height of the cone. The radius of the cone is 1 centimeter and the height is 3.4 centimeters.
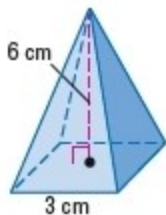
$$V = \dfrac{1}{3}\pi r^2 h$$
$$= \dfrac{1}{3}\pi (1)^2 (3.4)$$
$$\approx 3.6$$

Therefore, the volume of the cone is about 3.6 cm^3.

ANSWER:

3.6 cm^3

24. Find the volume of the regular pyramid.

SOLUTION:

The volume of a pyramid is $V = \dfrac{1}{3}Bh$, where B is the area of the base and h is the height of the pyramid. The base of this pyramid is a square with a side of 3 centimeters. The height of the pyramid is 6 centimeters.

$$V = \dfrac{1}{3}Bh$$
$$= \dfrac{1}{3}(3 \times 3)(6)$$
$$= 18$$

So, the volume of the pyramid is 18 cm^3.

ANSWER:

18 cm^3

25. **ARCHITECTURE** The Great Pyramid measures 756 feet on each side of the base and the height is 481 feet. Find the volume of the pyramid.

SOLUTION:

The volume of a pyramid is $V = \dfrac{1}{3}Bh$, where B is the area of the base and h is the height of the pyramid. The base of the Great Pyramid is a square with sides of 756 feet. It has a height of 481 feet.
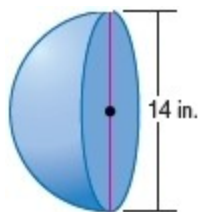
$$V = \frac{1}{3}Bh$$
$$= \frac{1}{3}(756 \times 756)(481)$$
$$= 91,636,272$$

Therefore, the volume of the Great Pyramid is 91,636,272 ft³.

ANSWER:

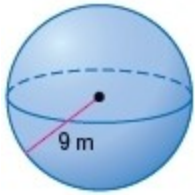91,636,272 ft³

Find the surface area of each figure.

26.

SOLUTION:

$$S = \frac{1}{2}\left(4\pi r^2\right) + \pi r^2$$
$$= \frac{1}{2}\left[4\pi(7)^2\right] + \pi(7)^2$$
$$= 98\pi + 49\pi$$
$$= 147\pi$$
$$\approx 461.8$$

ANSWER:

461.8 in²

27.

SOLUTION:

$$S = 4\pi r^2$$
$$= 4\pi(9)^2$$
$$= 324\pi$$
$$\approx 1017.9$$

ANSWER:

1017.9 in^2

Find the volume of each sphere or hemisphere. Round to the nearest tenth.

28. hemisphere: circumference of great circle = 24π m

SOLUTION:

Find *r*.

$$2\pi r = 24\pi$$
$$r = 12$$

Find the volume.

$$V = \tfrac{2}{3}\pi r^3$$
$$= \tfrac{2}{3}\pi(12)^3$$
$$= \frac{3456\pi}{3}$$
$$\approx 3619.1$$

ANSWER:

3619.1 m^3

29. sphere: area of great circle $= 55\pi$ in^2

    SOLUTION:
    Find r.

    $$\pi r^2 = 55\pi$$
    $$r^2 = 55$$
    $$r = \sqrt{55}$$

    Find the volume.

    $$V = \tfrac{4}{3}\pi r^3$$
    $$= \tfrac{4}{3}\pi \left(\sqrt{55}\right)^3$$
    $$\approx 1708.6$$

    ANSWER:
    1708.6 in^3

30. **CONSTRUCTION** Cement is poured into a hemisphere that is 6 cm across. What is the volume of cement used?

    SOLUTION:

    $$V = \tfrac{2}{3}\pi r^3$$
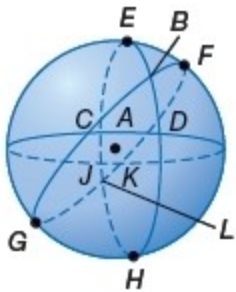 $$= \tfrac{2}{3}\pi (3)^3$$
    $$= \tfrac{54\pi}{3}$$
    $$\approx 56.5$$

    ANSWER:
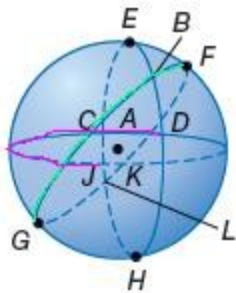   56.5 cm^3

Name each of the following on sphere A .

31. two lines containing point C

SOLUTION:

$\overleftrightarrow{FG}$ and $\overleftrightarrow{DJ}$ are lines on sphere A that contain point C.

ANSWER:

$\overleftrightarrow{FG}, \overleftrightarrow{DJ}$

32. a segment containing point H

SOLUTION:
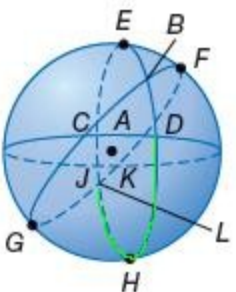
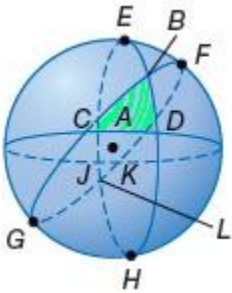$\overline{DL}$ is a segment on sphere A that contains point H.

ANSWER:

$\overline{DL}$
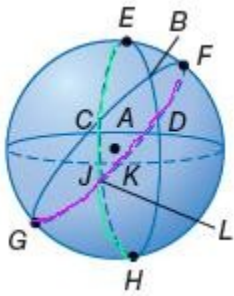
33. a triangle containing point *B*

   SOLUTION:

   $\triangle CBD$

   ANSWER:

   $\triangle CBD$

34. two lines containing point *L*

   SOLUTION:

   $\overleftrightarrow{HE}$ and $\overleftrightarrow{GF}$ are lines on sphere *A* that contain point *L*.

   ANSWER:

   $\overleftrightarrow{HE}$, $\overleftrightarrow{GF}$

35. a segment containing point J

SOLUTION:
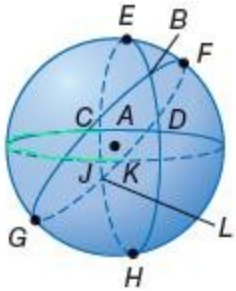
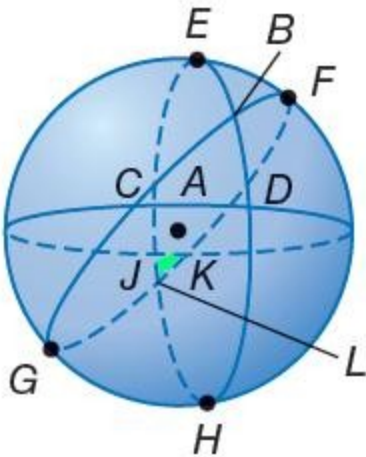$\overline{KC}$ is a segment on sphere A that contains point J.

ANSWER:

$\overline{KC}$

36. a triangle containing point K

SOLUTION:

$\triangle JKL$

ANSWER:

$\triangle JKL$

37. **MARBLES** Determine whether figure *y* on the sphere shown is a line in spherical geometry.

SOLUTION:

Notice that figure *y* does not go through the pole of the sphere. Therefore figure *y* is not a great circle and so not a line in spherical geometry.

ANSWER:

no

Determine whether each pair of solids is *similar*, *congruent*, or *neither*. If the solids are similar, state the scale factor.

38.
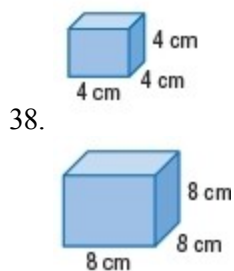
SOLUTION:

Ratio of lengths: $\dfrac{4}{8} = \dfrac{1}{2}$

Ratio of widths: $\dfrac{4}{8} = \dfrac{1}{2}$
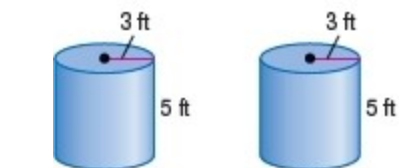
Ratio of heights: $\dfrac{4}{8} = \dfrac{1}{2}$

The ratios of the corresponding measures are equal, so the solids are similar. The scale factor is 1:2. Since the scale factor is not 1:1, the solids are not congruent.
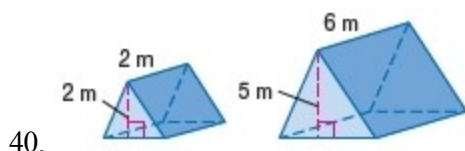
ANSWER:

similar; 1:2

39.

SOLUTION:

Ratio of radii: $\dfrac{3}{3} = \dfrac{1}{1}$

Ratio of heights: $\dfrac{5}{5} = \dfrac{1}{1}$

The ratios of the corresponding measures are equal, so the solids are similar. The scale factor is 1:1. Since the scale factor is 1:1, the solids are congruent.
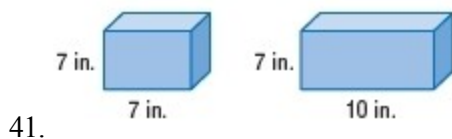
ANSWER:

congruent

40.

SOLUTION:

Ratio of lengths: $\dfrac{2}{6} = \dfrac{1}{3}$

Ratio of heights: $\dfrac{2}{5}$

Since the ratios of corresponding measures are not equal, the prisms are neither congruent nor similar.

ANSWER:

neither

41.

SOLUTION:

Ratio of lengths: $\dfrac{7}{10}$

Ratio of widths: $\dfrac{7}{7} = \dfrac{1}{1}$

Since the ratios of corresponding measures are not equal, the prisms are neither congruent nor similar.

ANSWER:

neither

42. **MODELS** A collector's model car is scaled so that 1 inch on the model equals $5\frac{3}{4}$ feet on the actual car. If the model is $\frac{4}{5}$ inches high, how high is the actual car?

SOLUTION:

Form a proportion.
Let x be the height of the actual car.

$$\frac{1}{\left(\frac{4}{5}\right)} = \frac{\left(5\frac{3}{4}\right)}{x}$$

$$x = \left(\frac{4}{5}\right)\left(5\frac{3}{4}\right)$$

$$= \left(\frac{4}{5}\right)\left(\frac{23}{4}\right)$$

$$= 4\frac{3}{5} \text{ ft}$$

ANSWER:

$4\frac{3}{5}$ ft