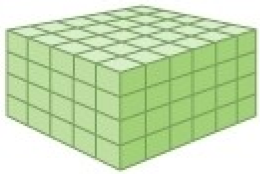
Mid-Chapter Quiz: Lessons 12-1 through 12-4

1. Describe how to use isometric dot paper to sketch the following figure.



SOLUTION:

Use isometric dot paper to sketch a rectangular prism 4 units high, 6 units long, and 5 units wide.

ANSWER:

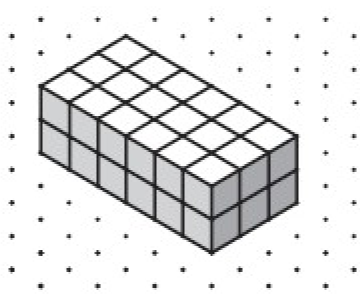
Use isometric dot paper to sketch a rectangular prism 4 units high, 6 units long, and 5 units wide.

2. Use isometric dot paper to sketch a rectangular prism 2 units high, 3 units long, and 6 units wide.

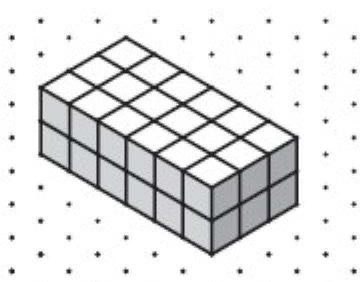
SOLUTION:

Mark the front corner of the solid. Draw 2 units down, 6 units to the left, and 3 units to the right. Draw 6 units left from this last point. Then draw a rectangle for the top of the solid.

Draw segments 2 units down from each vertex for the vertical edges. Connect the appropriate vertices using dashed lines for the hidden edges.



ANSWER:

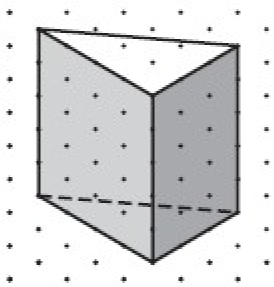


3. Use isometric dot paper to sketch a triangular prism 5 units high, with two sides of the base that are 4 units long and 3 units long.

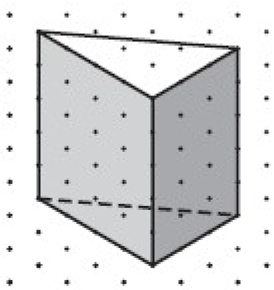
SOLUTION:

Mark the front corner of the solid. Draw 5 units down, 4 units to the left, and 3 units to the right. Connect the other two vertices to complete the triangle.

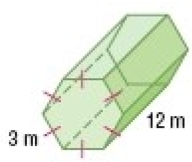
Draw segments 5 units down from each vertex for the vertical edges. Connect the appropriate vertices using dashed lines for the hidden edges.



ANSWER:



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

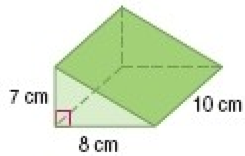
4. 

SOLUTION:

$$\begin{aligned} L &= Ph \\ &= (3 \times 6)(12) \\ &= 18(12) \\ &= 216 \end{aligned}$$

ANSWER:

216 m^2

5. 

SOLUTION:

Find the length of the third side of the triangle.

$$a^2 + b^2 = c^2$$
$$7^2 + 8^2 = c^2$$
$$49 + 64 = c^2$$
$$\sqrt{113} = c$$

Now find the lateral area.

$$\begin{aligned} L &= Ph \\ &= \left(7 + 8 + \sqrt{113}\right)(10) \\ &= \left(15 + \sqrt{113}\right)(10) \\ &\approx 256.3 \end{aligned}$$

ANSWER:

256.3 cm^2

6. **MULTIPLE CHOICE** Coaxial cable is used to transmit long-distance telephone calls, cable television programming, and other communications. A typical coaxial cable contains 22 copper tubes and has a diameter of 3 inches. What is the approximate lateral area of a coaxial cable that is 500 feet long?

A 16.4 ft^2

B 196.3 ft^2

C 294.5 ft^2

D 392.7 ft^2

SOLUTION:

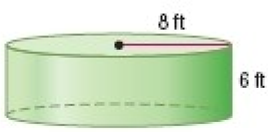
3 inches is equivalent to $\frac{1}{4}$ ft, so the radius of the cable is $\frac{1}{8}$ ft.

$$\begin{aligned} L &= 2\pi rh \\ &= 2\pi\left(\frac{1}{8}\right)(500) \\ &= 125\pi \\ &\approx 392.7 \end{aligned}$$

ANSWER:

D

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

7. 

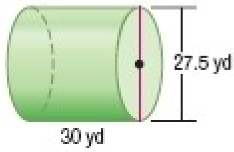
SOLUTION:

$$\begin{aligned} L &= 2\pi rh \\ &= 2\pi(8)(6) \\ &= 96\pi \\ &\approx 301.6 \end{aligned}$$

$$\begin{aligned} S &= 2\pi rh + 2B \\ &= 2\pi(8)(6) + 2\pi(8)^2 \\ &= 96\pi + 128\pi \\ &= 224\pi \\ &\approx 703.7 \end{aligned}$$

ANSWER:

301.6 ft^2; 703.7 ft^2

8. 

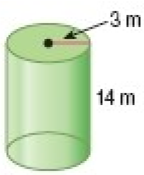
SOLUTION:

$$\begin{aligned} L &= 2\pi rh \\ &= 2\pi(13.75)(30) \\ &= 825\pi \\ &\approx 2591.8 \end{aligned}$$

$$\begin{aligned} S &= 2\pi rh + 2B \\ &= 2\pi(13.75)(30) + 2\pi(13.75)^2 \\ &= 825\pi + 378.125\pi \\ &= 1203.125\pi \\ &\approx 3779.7 \end{aligned}$$

ANSWER:

2591.8 yd^2; 3779.7 yd^2

9. 

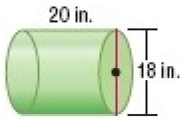
SOLUTION:

$$\begin{aligned} L &= 2\pi rh \\ &= 2\pi(3)(14) \\ &= 84\pi \\ &\approx 263.9 \end{aligned}$$

$$\begin{aligned} S &= 2\pi rh + 2B \\ &= 2\pi(3)(14) + 2\pi(3)^2 \\ &= 84\pi + 18\pi \\ &= 102\pi \\ &\approx 320.4 \end{aligned}$$

ANSWER:

263.9 m^2; 320.4 m^2

10. 

SOLUTION:

$$\begin{aligned} L &= 2\pi rh \\ &= 2\pi(9)(20) \\ &= 360\pi \\ &\approx 1131.0 \end{aligned}$$

$$\begin{aligned} S &= 2\pi rh + 2B \\ &= 2\pi(9)(20) + 2\pi(9)^2 \\ &= 360\pi + 162\pi \\ &= 522\pi \\ &\approx 1639.9 \end{aligned}$$

ANSWER:

1131.0 in^2; 1639.9 in^2

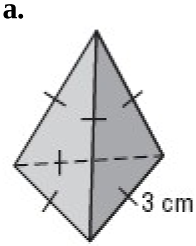
11. **COLLECTIONS** Soledad collects unique salt-and-pepper shakers. She inherited a pair of tetrahedral shakers from her mother.

a. Each edge of a shaker measures 3 centimeters. Make a sketch of one shaker.

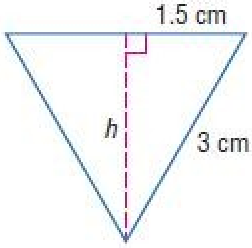
b. Find the total surface area of one shaker.

SOLUTION:

a.



b. Each tetrahedral shaker is composed of 4 equilateral triangles. Rather than use the formula for the surface area of a pyramid $S = \frac{1}{2}P\ell + B$, it is easier for this figure to find the surface area by multiplying the area of one of the equilateral triangles by 4. Since each triangle is equilateral, the height will bisect the base. Use the Pythagorean Theorem to find the height *h* of the triangle.



$$\begin{aligned} h^2 + 1.5^2 &= 3^2 \\ h^2 &= 9 - 2.25 \\ h &= \sqrt{6.75} \end{aligned}$$

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= \frac{1}{2}(3)\left(\sqrt{6.75}\right) \\ &= \frac{3}{2}\sqrt{6.75} \end{aligned}$$

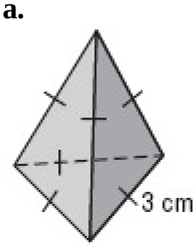
Now find the surface area *S* of the regular tetrahedron.

$$\begin{aligned} S &= 4B \\ &= 4\left(\frac{3}{2}\sqrt{6.75}\right) \\ &\approx 15.6 \end{aligned}$$

Therefore, the surface area of one shaker is about 15.6 cm^2.

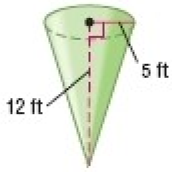
ANSWER:

a.



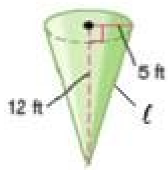
b. about 15.6 cm^2

Find the surface area of each regular pyramid or cone. Round to the nearest tenth if necessary.

12. 

SOLUTION:

For this cone, the radius *r* is 5 feet and the height *h* is 12 feet. Use the Pythagorean Theorem to find the slant height ℓ.



$$\ell^2 = 5^2 + 12^2$$
$$\ell^2 = 25 + 144$$
$$\ell = \sqrt{169} \text{ or } 13$$

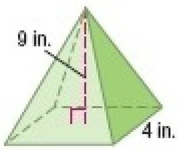
Now find the surface area of the cone.

$$\begin{aligned} S &= \pi r \ell + \pi r^2 \\ &= \pi(5)(13) + \pi(5)^2 \\ &= 65\pi + 25\pi \\ &= 90\pi \text{ or about } 282.7 \end{aligned}$$

Therefore, the surface area of the cone is about 282.7 ft^2.

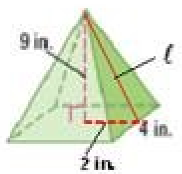
ANSWER:

282.7 ft^2

13. 

SOLUTION:

The figure is a square-based pyramid with sides of 4 inches and a height of 9 inches. Use the Pythagorean Theorem to find the slant height ℓ.



$$\ell^2 = 2^2 + 9^2$$
$$\ell^2 = 4 + 81$$
$$\ell = \sqrt{85}$$

Find the area of the base *B*.

$$A = s^2$$
$$= (4)^2 \text{ or } 16$$

So, the area of the base is 16 in^2.

Find the surface area *S* of the regular pyramid.

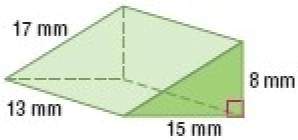
$$S = \frac{1}{2}P\ell + B$$
$$= \frac{1}{2}(4 \times 4)\left(\sqrt{85}\right) + 16$$
$$= 8\sqrt{85} + 16$$
$$\approx 89.8$$

Therefore, the surface area of the regular pyramid is about 89.8 in^2.

ANSWER:

89.8 in^2

Find the volume of each prism or cylinder. Round to the nearest tenth if necessary.

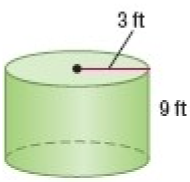
14. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= \frac{1}{2}(8)(15) \cdot 13 \\ &= 60 \cdot 13 \\ &= 780 \end{aligned}$$

ANSWER:

780 mm^3

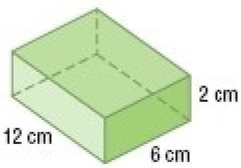
15. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= \pi r^2 \cdot h \\ &= \pi(3)^2(9) \\ &\approx 254.5 \end{aligned}$$

ANSWER:

254.5 ft^3

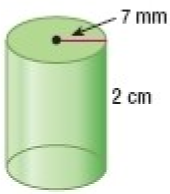
16. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= 2(6)(12) \\ &= 144 \end{aligned}$$

ANSWER:

144 cm^3

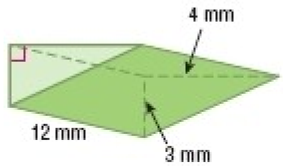
17. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= \pi r^2 \cdot h \\ &= \pi(7)^2(20) \\ &\approx 3078.8 \end{aligned}$$

ANSWER:

3078.8 mm^3

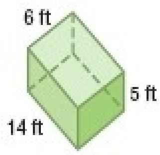
18. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= \frac{1}{2}(3)(4)\cdot 12 \\ &= 6\cdot 12 \\ &= 72 \end{aligned}$$

ANSWER:

72 mm^3

19. 

SOLUTION:

$$\begin{aligned} V &= Bh \\ &= (5)(6)(14) \\ &= 420 \end{aligned}$$

ANSWER:

420 ft^3

20. **METEOROLOGY** The TIROS weather satellites were a series of weather satellites that carried television and infrared cameras and were covered by solar cells. If the cylinder-shaped body of a TIROS had a diameter of 42 inches and a height of 19 inches, what was the volume available for carrying instruments and cameras? Round to the nearest tenth.

SOLUTION:

The volume V of a cylinder is $V = Bh$ or $V = \pi r^2 h$, where B is the area of the base, h is the height of the cylinder, and r is the radius of the base.

r = 21 in. and h = 19 in.

$V = \pi r^2 h = \pi(21)^2(19) \approx 26,323.4 \text{ in}^3$.

Therefore, about 26,323.4 in^2 of space is available for carrying instruments and cameras.

ANSWER:

26,323.4 in^2