

LESSON  
12.2**Study Guide**

For use with pages 802–809

**GOAL** Find the surface areas of prisms and cylinders.**Vocabulary**

A **prism** is a polyhedron with two congruent faces, called *bases*, that lie in parallel planes.

**Lateral faces** are parallelograms formed by connecting the corresponding vertices of the bases.

**Lateral edges** are the segments connecting the corresponding vertices of the bases.

The **surface area** of a polyhedron is the sum of the areas of its faces.

The **lateral area** of a polyhedron is the sum of the areas of its lateral faces.

A **net** is the two-dimensional representation of the faces.

A **right prism** is a prism with lateral edges that are perpendicular to both bases.

An **oblique prism** is a prism with lateral edges that are not perpendicular to the bases.

**Theorem 12.2 Surface Area of a Right Prism:** The surface area  $S$  of a right prism is  $S = 2B + Ph = aP + Ph$ , where  $a$  is the apothem of the base,  $B$  is the area of a base,  $P$  is the perimeter of a base, and  $h$  is the height.

A **cylinder** is a solid with congruent circular bases that lie in parallel planes.

A **right cylinder** is a cylinder that has a perpendicular segment that joins the centers of the bases.

**Theorem 12.3 Surface Area of a Right Cylinder:** The surface area  $S$  of a right cylinder is  $S = 2B + Ch = 2\pi r^2 + 2\pi r h$ , where  $B$  is the area of a base,  $C$  is the circumference of a base,  $r$  is the radius of a base, and  $h$  is the height.

**EXAMPLE 1** Find the surface area of a right prism

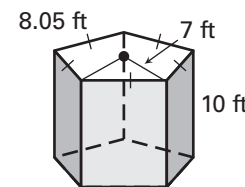
Find the surface area of the right pentagonal prism.

**Solution****STEP 1** Find the perimeter and area of a base of the prism.

Each base is a regular pentagon.

$$\text{Perimeter } P = 5(8.05) = 40.25$$

$$\text{Apothem } a = \sqrt{7^2 - 4.025^2} \approx 5.73$$



**LESSON  
12.2****Study Guide** *continued*  
For use with pages 802–809**STEP 2** Use the formula for the surface area that uses the apothem.

$$S = aP + Ph$$

Surface area of a right prism

$$S \approx (5.73)(40.25) + (40.25)(10)$$

Substitute known values.

$$S \approx 633.13$$

Simplify.

The surface area of the right pentagonal prism is about 633.13 square feet.

**EXAMPLE 2** Find the surface area of a cylinder**Find the surface area of the right cylinder.****Solution**

$$S = 2\pi r^2 + 2\pi rh$$

Surface area of a cylinder

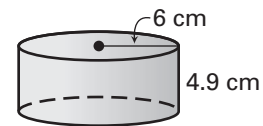
$$S = 2\pi(6)^2 + 2\pi(4)(4.9)$$

Substitute known values.

$$S \approx 349.35$$

Use a calculator.

The surface area of the cylinder is about 349.35 square centimeters.

**EXAMPLE 3** Find the height of a cylinder**Find the height of the right cylinder shown, which has a surface area of 168.09 square meters.****Solution**

$$S = 2\pi r^2 + 2\pi rh$$

Surface area of a cylinder

$$168.09 = 2\pi(4)^2 + 2\pi(4)(h)$$

Substitute known values.

$$168.09 = 32\pi + 8\pi h$$

Simplify.

$$168.09 - 32\pi = 8\pi h$$

Subtract  $32\pi$  from each side.

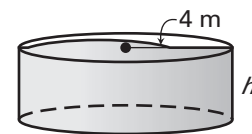
$$67.56 \approx 8\pi h$$

Simplify. Use a calculator.

$$2.7 \approx h$$

Divide each side by  $8\pi$ .

The height of the cylinder is about 2.7 meters.

**Exercises for Examples 1, 2, and 3**

- Find the surface area of a right rectangular prism with height 8 inches, length 4 inches, and width 5 inches.
- Find the surface area of a right cylinder with height 20 centimeters and radius 12 centimeters. Round your answer to two decimal places.
- Find the height of a right cylinder with radius 7 feet and surface area  $392\pi$  square feet.