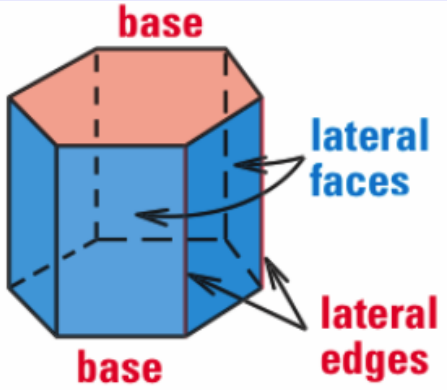
12.2 Surface Area of Prisms and Cylinders

A **prism** is a polyhedron with two congruent faces, called *bases*, that lie in parallel planes. The other faces, called **lateral faces**, are parallelograms formed by connecting the corresponding vertices of the bases. The segments connecting these vertices are **lateral edges**. Prisms are classified by the shapes of their 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.

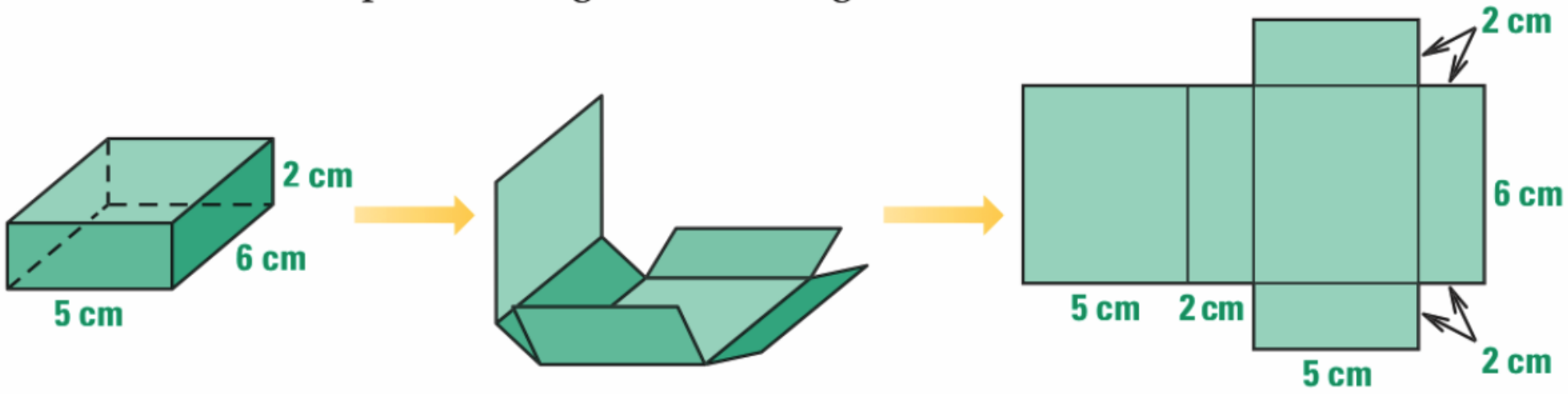
Imagine that you cut some edges of a polyhedron and unfold it. The two-dimensional representation of the faces is called a **net**. As you saw in the Activity on page 802, the surface area of a prism is equal to the area of its net.

EXAMPLE 1 Use the net of a prism

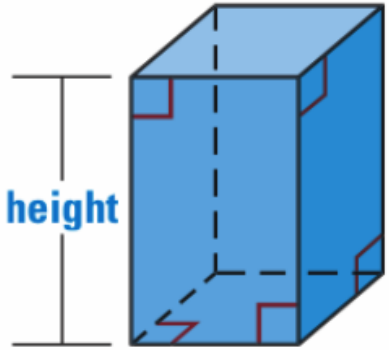
Find the surface area of a rectangular prism with height 2 centimeters, length 5 centimeters, and width 6 centimeters.

Solution

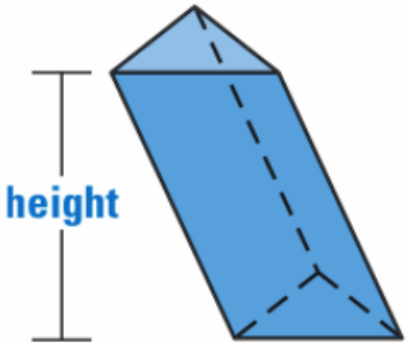
STEP 1 **Sketch** the prism. Imagine unfolding it to make a net.



RIGHT PRISMS The height of a prism is the perpendicular distance between its bases. In a **right prism**, each lateral edge is perpendicular to both bases. A prism with lateral edges that are not perpendicular to the bases is an **oblique prism**.



Right rectangular prism



Oblique triangular prism

THEOREM

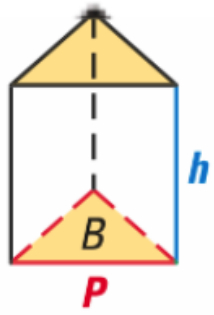
For Your Notebook

THEOREM 12.2 Surface Area of a Right Prism

The surface area S of a right prism is

$$S = 2B + Ph = aP + Ph,$$

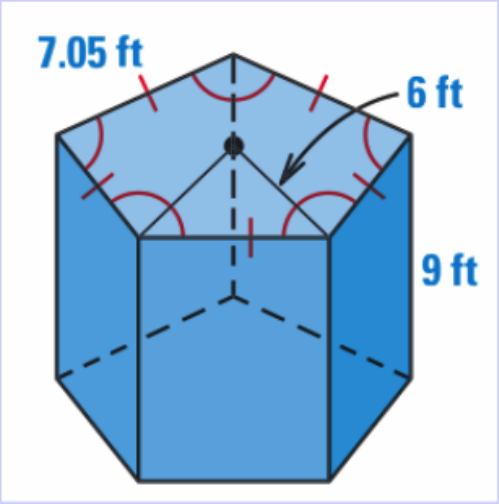
where a is the apothem of the base, B is the area of a base, P is the perimeter of a base, and h is the height.



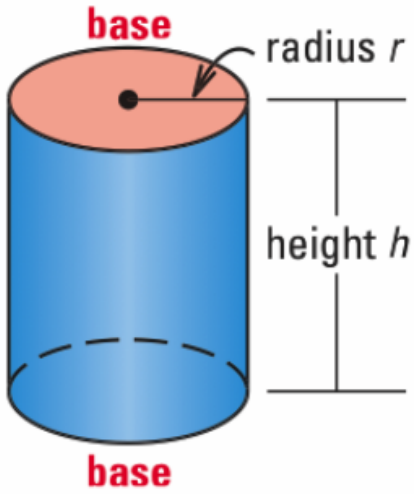
$$S = 2B + Ph = aP + Ph$$

EXAMPLE 2 Find the surface area of a right prism

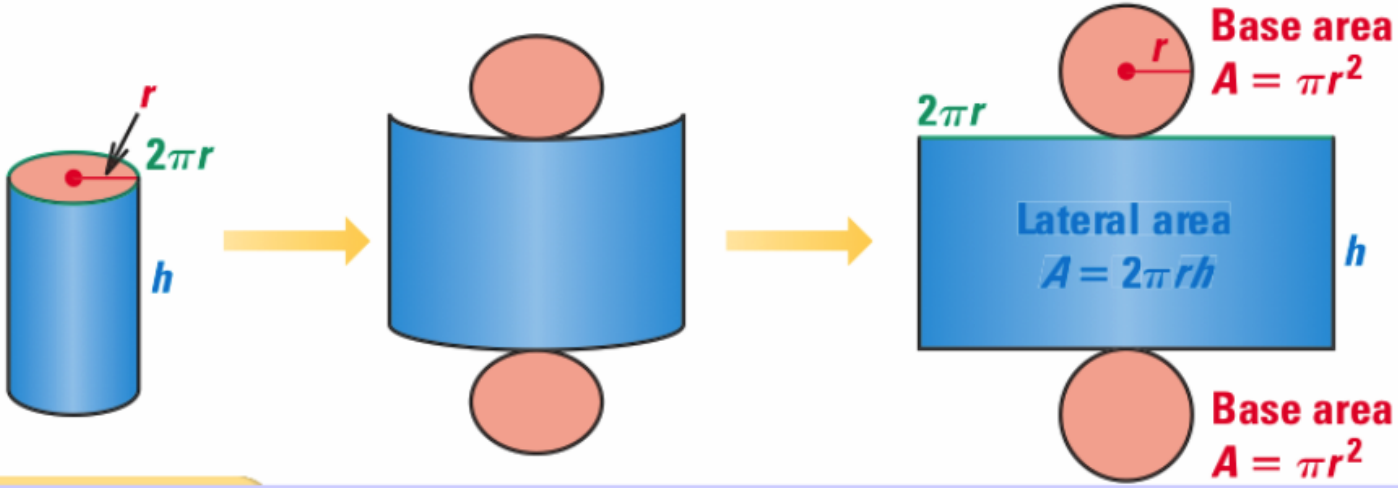
Find the surface area of the right pentagonal prism.



CYLINDERS A **cylinder** is a solid with congruent circular bases that lie in parallel planes. The height of a cylinder is the perpendicular distance between its bases. The radius of a base is the *radius* of the cylinder. In a **right cylinder**, the segment joining the centers of the bases is perpendicular to the bases.



The lateral area of a cylinder is the area of its curved surface. It is equal to the product of the circumference and the height, or $2\pi rh$. The surface area of a cylinder is equal to the sum of the lateral area and the areas of the two bases.



THEOREM

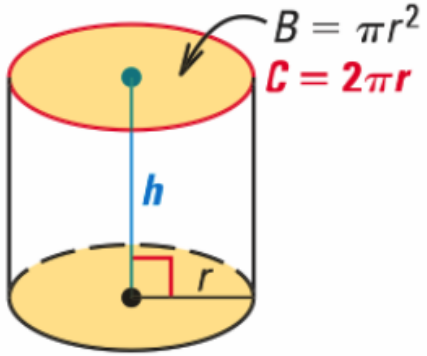
For Your Notebook

THEOREM 12.3 Surface Area of a Right Cylinder

The surface area S of a right cylinder is

$$S = 2B + Ch = 2\pi r^2 + 2\pi rh,$$

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.



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

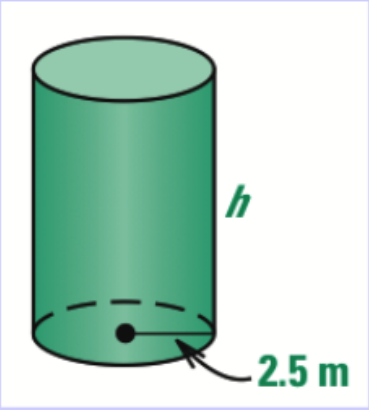
EXAMPLE 3 Find the surface area of a cylinder

COMPACT DISCS You are wrapping a stack of 20 compact discs using a shrink wrap. Each disc is cylindrical with height 1.2 millimeters and radius 60 millimeters. What is the minimum amount of shrink wrap needed to cover the stack of 20 discs?

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

EXAMPLE 4 Find the height of a cylinder

Find the height of the right cylinder shown, which has a surface area of 157.08 square meters.



Assignment:

12.2 Worksheet

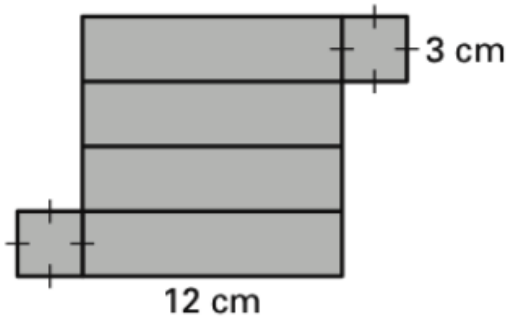
LESSON 12.2

Practice

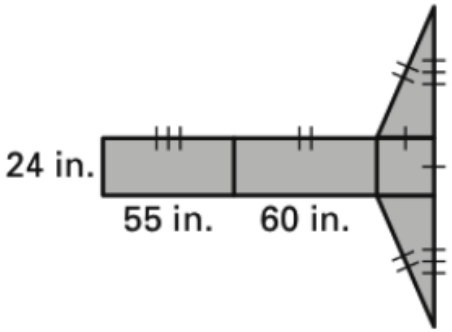
For use with pages 802–809

Find the surface area of the solid formed by the net. Round your answer to two decimal places.

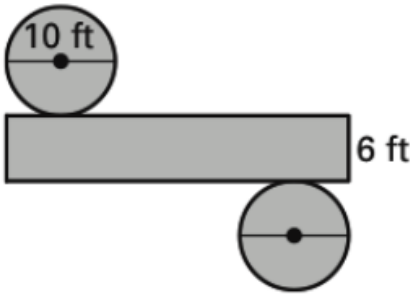
1.



2.

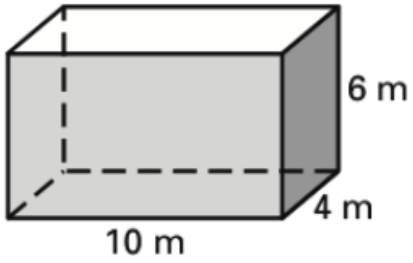


3.

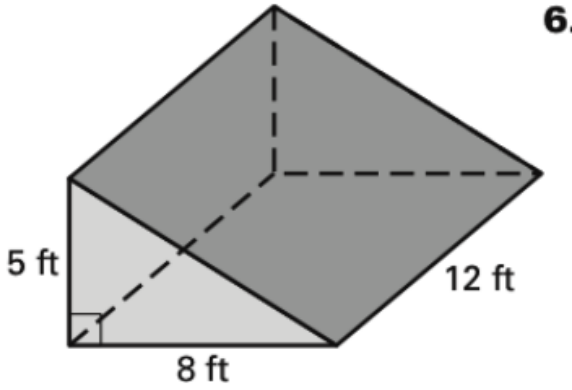


Find the surface area of the right prism. Round your answer to two decimal places.

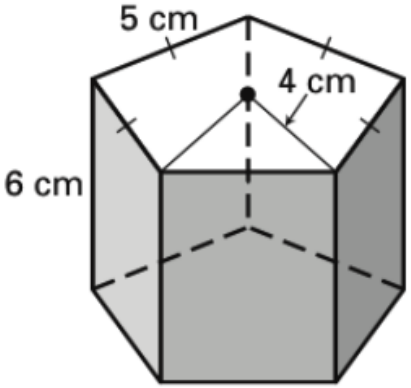
4.



5.



6.



Find the surface area of the right cylinder using the given radius *r* and height *h*. Round your answer to two decimal places.

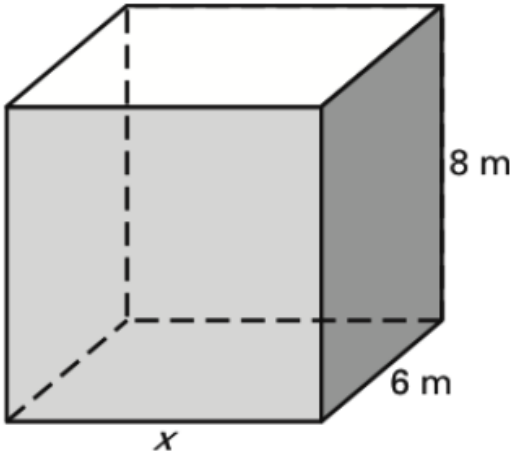
7. $r = 5$ cm; $h = 15$ cm

8. $r = 1.1$ ft; $h = 3.2$ ft

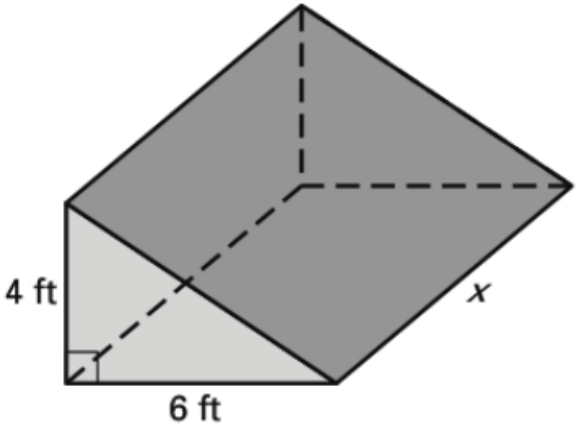
9. $r = 12$ in.; $h = 18$ in.

Solve for *x* given the surface area *S* of the right prism or right cylinder. Round your answer to two decimal places.

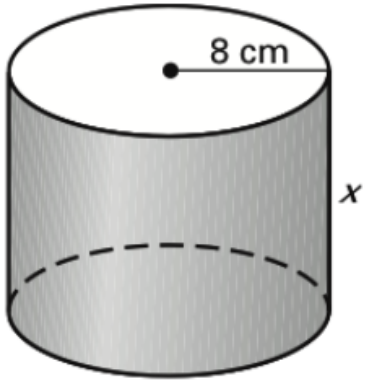
10. $S = 320\ \text{m}^2$



11. $S = 200\ \text{ft}^2$



12. $S = 1000\ \text{cm}^2$



13. Surface Area of a Prism A rectangular prism has a base with a width of x units and a height of y units. The depth of the prism is z units. Write the surface area S in terms of x, y, and z.

14. Surface Area of a Prism A triangular prism with a right triangular base has one leg length that is 6 inches and the other leg length that is 8 inches. The height of the prism is 7 inches. What is the surface area of the prism?

15. Surface Area of a Prism A triangular prism with a scalene triangular base has legs with lengths of 5 inches, 7 inches, and 8 inches. The height of the prism is 10 inches. What is the surface area of the prism?

16. Multiple Choice The radius and height of a right cylinder are each multiplied by 2. What is the change in the surface area of the cylinder?

A. The surface area is 2 times the original surface area.

B. The surface area is 4 times the original surface area.

C. The surface area is 6 times the original surface area.

D. The surface area is 8 times the original surface area.

Assignment

Day 2:

p. 806 (3-17, 25)