10.1.2   What if the base is not a polygon?

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Surface Area and Volume of a Cylinder
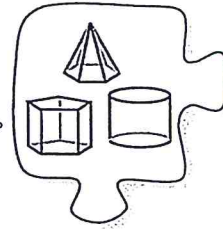
Soup cans and rolls of paper towels are examples of **cylinders**. Cylinders are like prisms in many ways. However, a prism has a polygon as its base, while a cylinder has a circle as its base. In this lesson, you will compare the surface areas and volumes of prisms and cylinders.
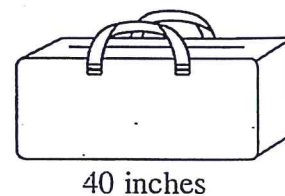
10-18.   COMPARING THE GYM BAGS

The CPM Sports Company is planning a new product line of gym bags. The outside of the bag (without the ends) will be made with a rectangular piece of cloth that is 40 inches by 52 inches. The company is trying to decide whether the end pieces will be squares or circles. CPM designers want to compare the surface area and volume of each bag and consider the advantages and disadvantages of each shape. Your team will help provide data for the designers' decision.

Use a standard piece of paper that measures 8.5 inches on one edge and 11 inches on the other to create a model of each gym bag. To model the square-based prism:
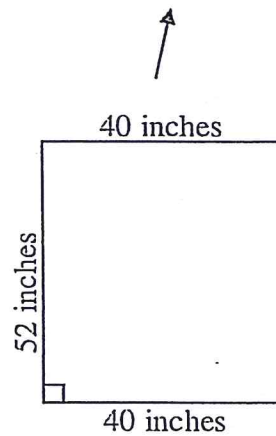
- Fold the paper in half so that the 8.5-inch edges match up, and then unfold.

- Fold each 8.5-inch edge in to the center crease, and then unfold.

- Tape the 8.5-inch edges together to form the **lateral faces** (the faces that are not the bases) of a square-based prism. The open squares at either end are the bases.

Use a new piece of paper to model the cylinder:

- Roll the paper so that one 8.5-inch edge matches up with the other.

- Tape the edges together to form the lateral face of a cylinder. The open circles formed at each end are the bases.
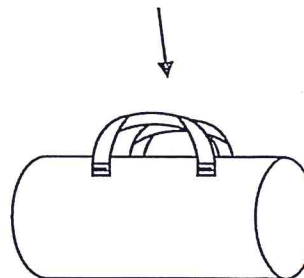
Your Task: Using the models for reference, find the surface area and volume of each gym bag. How much fabric will it take to make each bag? How much will each bag hold? Remember that the shorter length on the paper (8.5 inches) models the 40-inch dimension of the cloth, and the longer length (11 inches) models the 52-inch dimension of the cloth. The model you have created is *not* to scale.

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10-26. Find the area of the base of each cylinder below, and then calculate the volume of each cylinder. Show your steps.

a.

$r = 5$ cm

10 cm

b.

$r = 3.4$ cm

9 cm
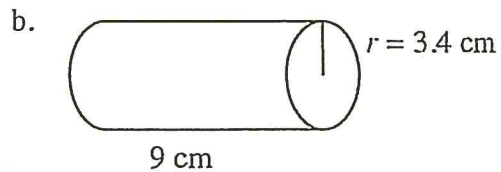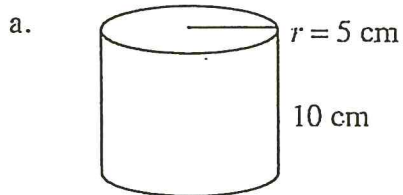
10-28. Find the length of the side labeled x in each of the right triangles pictured below. Identify each answer as a rational or irrational number.

a.

13

5

x

b.

x

3

6

c.

15

x

17
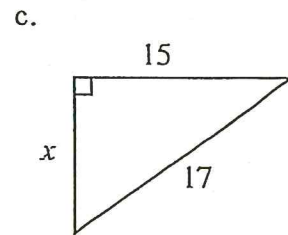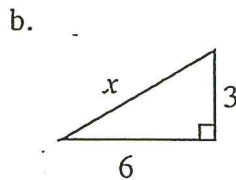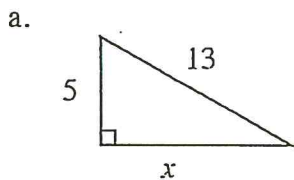
10-29. Simplify each expression.

a. $\dfrac{5^3}{5^9}$

b. $\dfrac{(ab)^4}{ab^3}$

c. $8x^{-3}(8x)^2$

d. $(\tfrac{1}{6})^5 \cdot (6)^3$