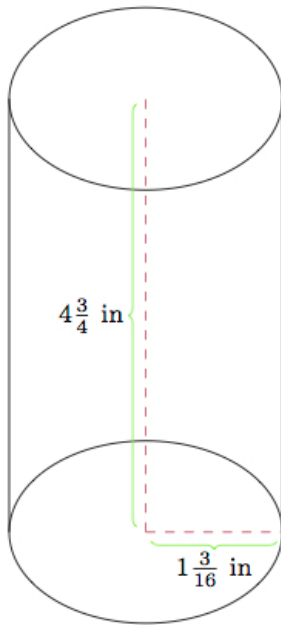


# How thick is a soda can I?

## Task

A cylindrical soda can is made of aluminum. It is approximately  $4\frac{3}{4}$  inches high and the top and bottom have a radius of approximately  $1\frac{3}{16}$  inches:



- Find the approximate surface area of the soda can. What assumptions do you use in your estimate?
- The density of aluminum is approximately 2.70 grams per cubic centimeter. If the mass of the soda can is approximately 15 grams, how many cubic centimeters of aluminum does it contain?
- Using the answers to (a) and (b) estimate how thick the aluminum can is.

## Solution

- a. The surface of the can is made up of the top and bottom together with the cylindrical part of the can. In practice, the top and bottom are not flat but are well approximated by circles. According to the given information, the radius of these circles is about  $1\frac{3}{16}$  inches. So the area is about  $\pi \times \left(1\frac{3}{16}\right)^2$  square inches or about 4.4 square inches. If the cylindrical part of the can were made flat, it would be a rectangle with dimensions  $4\frac{3}{4}$  inches by  $\pi \times 2 \times 1\frac{3}{16}$  inches or about 35.4 square inches. So the total surface area of the can is about 44.2 square inches.
- b. If there are about 15 grams of aluminum in the soda can and the density of aluminum is about 2.70 grams per cubic centimeters then there are about

$$\frac{15 \text{ grams}}{2.70 \text{ grams per cubic centimeter}} \approx 5.6 \text{ cubic centimeters}$$

of aluminum in the soda can.

- c. Since the amount of aluminum is given in cubic centimeters and the area of the soda can in square inches we need to make a conversion. There are about 2.54 centimeters per inch and so there are about  $(2.54)^2 \approx 6.5$  square centimeters per square inch. So

$$44.2 \text{ square inches} \approx (44.2 \times 6.5) \text{ square centimeters} = 287.3 \text{ square centimeters.}$$

To find the approximate thickness of the can we know, assuming that the thickness of the can is close to uniform, that

$$\text{thickness} \times 287.3 \text{ cm}^2 \approx 5.6 \text{ cm}^3.$$

This means that the approximate thickness of the can is about 0.02 centimeters or 0.2 millimeters.

