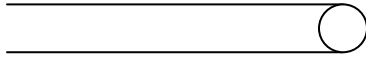


The JETS Challenge

Provided by Dave Meredith, Associate Professor,
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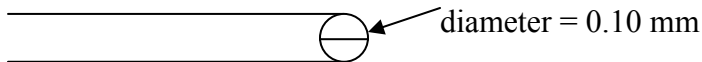


Challenge 24 – The Dental Floss Challenge

Problem:

The cross-section of average dental floss tape is a circle that measures 0.10 mm in diameter. Assume 82 percent of the U.S. population of 287 million people use on average a 60 cm strand one time per day.

If you take all the dental floss used in the U.S. for a year and wrap it into a single ball, what is the diameter of that ball in meters?



floss:

$$r = .05 \text{ mm} \times \frac{1\text{m}}{1,000\text{mm}}$$

$$r = 5 \times 10^{-5} \text{ meters}$$

Solution:

82% of 287,000,000 people = 235,340,000 people use 60 cm daily

$$\Rightarrow 235,340,000 \times 60 \text{ cm}$$

$$\begin{aligned} &= 14,120,400,000 \text{ cm per day} \\ &\quad \times 365 \text{ days} \\ &= 5.153,946 \times 10^{12} \text{ cm per year} \\ &= 5.153,946 \times 10^{10} \text{ m per year} \end{aligned}$$

So, total V used is a year

$$\begin{aligned} &= \pi r^2 \times L \text{ where } r = 5 \times 10^{-5} \\ &\quad L = 5.153,946 \times 10^{10} \text{ m} \end{aligned}$$

$$V = \pi(5 \times 10^{-5}) \times (5.153,946 \times 10^{10} \text{ m})$$

$$V = 404.789972265 \text{ m}^3$$

Since $V_{\text{sphere}} = \frac{4}{3} \pi r^3$, then

$$404.789972265 \text{ m}^3 = \frac{4}{3} \pi r^3$$

$$96.6364875 \text{ m}^3 = r^3$$

$$4.58895408125 \text{ m} = r$$

$$9.18 \text{ m} = \text{diameter}$$