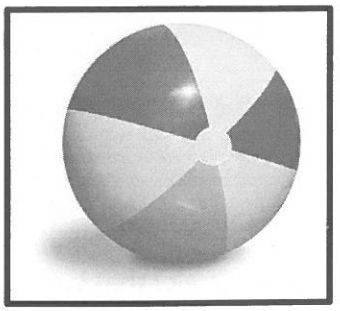
Example 2

A company manufactures beach balls made of plastic and filled with air. The ball is a sphere with a diameter of 20 cm.



radius = 10 cm

a) How much plastic would be required to manufacture the beach ball?

Surface Area of Sphere = $4\pi r^2$

$= 4 \times \pi \times (10\text{cm})^2$

Area of plastic $= 1256.6\ \text{cm}^2$

b) How much air would be needed to fill the ball?

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi\ (10\text{cm})^3$

Volume of Air $= 4188.8\ \text{cm}^3$

c) If plastic costs \$0.002 per cm^2, how much will the plastic cost for one beach ball?

Cost of plastic for one beach ball = surface area $\times$ \$ 0.002 $\times$ 1.12

$= 1256.6 \times 0.002 \times 1.12$

Cost of plastic = \$ 2.80

Taxes included

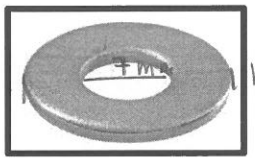
d) How much would it cost to produce 100 000 beach balls?

Cost to produced 100 000 beach balls = $100\,000 \times \$\ 2.80$

$= \$\ 281\,478.40$

Example 3

A hardware supply factory makes washers. A washer is a small metal disc placed between the head of a bolt and the nut the bolt is going to be inserted into (pictured right). Each washer is 1 mm thick. The diameter of the washer is 15 mm. The radius of the hole is 7 mm.



Determine the amount of metal required to produce 1 million washers.

① Find the amount of metal to produce 1 washer.
- Treat this case as 2 volumes (outer and inner)

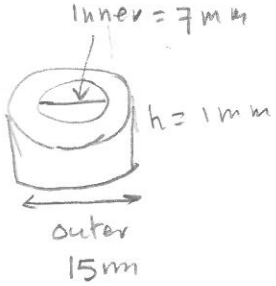
② Metal required for one washer = Outer Volume − inner volume

③ Outer Volume = $\pi r^2 h \Rightarrow \pi (15)^2 \times 1$

$= 706.9\ \text{mm}^3$

④ Inner Volume = $\pi r^2 h = \pi \times (7)^2 \times 1$

$= 153.9\ \text{mm}^3$



⑤ Metal required for 1 washer = $706.9\ \text{mm}^3 - 153.9\ \text{mm}^3 = 553.1\ \text{mm}^3$

⑥ Metal required for 1 million washers = $553\ \text{mm}^3 \times 1{,}000{,}000$

$= 553\,000\,000\ \text{mm}^3$