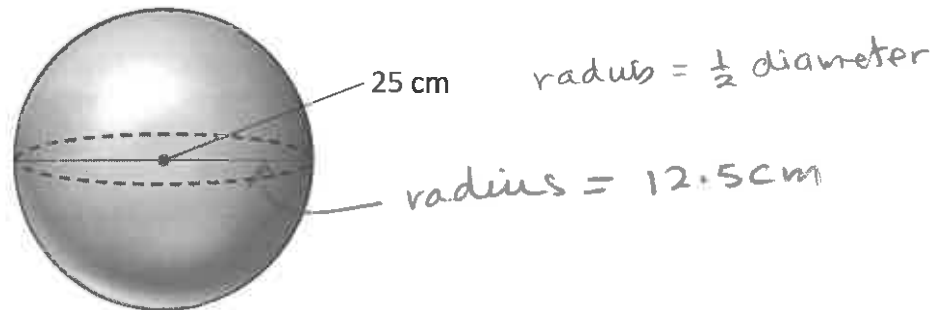


Example 4

An overseas company wants to make 200 000 smooth spherical toy balls (not hollow – made out of a solid piece of rubber) that have a diameter of 25 cm (as shown in the diagram below – not to scale):



- (Volume)
a) How much rubber will be needed to make one ball?

$$\begin{aligned} \text{Volume of a sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \pi \times (12.5)^3 \\ &= \boxed{8181.23 \text{ cm}^3} \end{aligned}$$

- b) Rubber costs \$17.20 per m^3 , and is only sold in whole units. The rubber you are purchasing is tax exempt. Calculate the rubber cost for manufacturing all 200 000 balls.

Cost of rubber for 200 000 balls: Volume of rubber \times Cost per m^3

Volume of rubber: Volume of 1 rubber ball \times # of rubber balls

$$8181.23 \text{ cm}^3 \times 200\,000 = 1\,636\,246\,174 \text{ cm}^3$$

To convert cm^3 to $\text{m}^3 \div 100^3$: $1\,636\,246\,174 \text{ cm}^3 \div 100^3 = 1636.24 \text{ m}^3 \rightarrow$ round up $\underline{\underline{1637 \text{ m}^3}}$

Cost of Rubber = $1637 \text{ m}^3 \times \17.20

$$= \boxed{\$28\,156.40}$$

- c) One person in the ball making factory can produce 150 balls per hour. If the company pays their employees \$3.90 per hour, what is the manpower cost to produce all 200 000 balls?

Cost to produce 200 000 balls = No. of hours to produce balls \times \$3.90

No. of hours to produce balls: $200\,000 \text{ balls} \div 150 \text{ balls per hour} = 1333.33 \text{ hours}$

Cost to produce balls: $1333.33 \times \$3.90$

$$= \boxed{\$5\,200}$$

- d) What should the company charge PER BALL to make a profit of \$1.00 on each ball?

Profit of \$1: Cost to produce 1 ball + \$1.00

Cost to produce 1 ball = $(\text{Cost of rubber} + \text{labour cost}) \div 200\,000$

$$= (\$28\,156.40 + \$5200) \div 200\,000 = \$0.17$$

So profit of \$1 = $\$0.17 + \$1.00 = \boxed{\$1.17}$

- e) What should the company charge PER BALL to make 800% profit? = $\boxed{\$1.17}$

To make 800% profit = $(\text{Cost to produce 1 ball} \times 800\%) + \0.17

$$= (\$0.17 \times \frac{800}{100}) + 0.17$$

$$= \boxed{\$1.53}$$