NCERT Solutions for Class 10 Maths Chapter 13 Surface Areas and Volumes Exercise 13.5

Exercise 13.5

1. A copper wire, 3 mm in diameter is wound about a cylinder whose length is 12 cm and diameter 10 cm, so as to cover the curved surface of the cylinder. Find the length and mass of the wire, assuming the density of copper to be 8.88 g per cm^3.

Ans. Number of rounds to cover 12 cm, i.e. 120 mm

$= \dfrac{120}{3} = 40$

Here, Diameter = 10 cm, Radius $(r) = \dfrac{10}{2}$ cm

Length of the wire in completing one round

$= 2\pi r = 2\pi \times 5 = 10\pi$ cm

Length of the wire in completing 40 rounds

$= 10\pi \times 40 = 400\pi$ cm

Radius of the copper wire $= \dfrac{3}{2}$ mm

$= \dfrac{3}{20}$ cm

$\therefore$ Volume of wire $= \pi\left(\dfrac{3}{20}\right)^2 (400\pi)$

$= 9\pi cm^3$
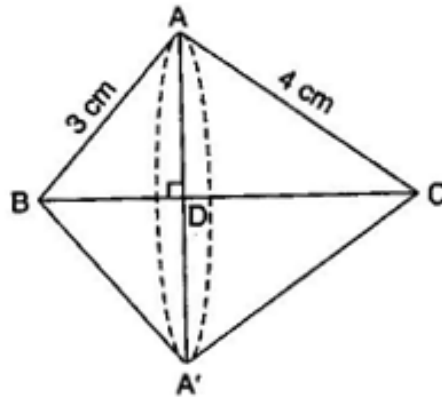
$\therefore$ Mass of the wire $= 9 \times (3.14)^2 \times 8.88$

$= 787.98$ g

2. A right triangle, whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of π as found appropriate)

Ans. Hypotenuse = $\sqrt{3^2 + 4^2}$ = 5 cm

In figure, $\triangle$ ADB ~ $\triangle$ CAB [AA similarity]

$\therefore \dfrac{AD}{CA} = \dfrac{AB}{CB}$

$\Rightarrow \dfrac{AD}{4} = \dfrac{3}{5}$

$\Rightarrow AD = \dfrac{12}{5}$ cm

Also, $\dfrac{DB}{AB} = \dfrac{AB}{CB}$

$\Rightarrow \dfrac{DB}{3} = \dfrac{3}{5}$

$\Rightarrow DB = \dfrac{9}{5}$ cm

$$\therefore \quad CD = BC - DB = 5 - \frac{9}{5} = \frac{16}{5} \text{ cm}$$

Volume of the double cone

$$= \frac{1}{3}\pi\left(\frac{12}{5}\right)^2\left(\frac{9}{5}\right) + \frac{1}{3}\pi\left(\frac{12}{5}\right)^2\left(\frac{16}{5}\right)$$

$$= \frac{1}{3} \times 3.14 \times \frac{12}{5} \times \frac{12}{5} \times 5 = 30.14 \text{ cm}^3$$

Surface area of the double cone

$$= \pi \times \frac{12}{5} \times 3 + \pi \times \frac{12}{5} \times 4$$

$$= \pi \times \frac{12}{5}(3+4) = 3.14 \times \frac{12}{5} \times 7$$

$$= 52.75 \text{ cm}^2$$

3.A cistern, internally measuring 150 cm ×120 cm ×110 cm has 129600 cm³ of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being 22.5 cm ×7.5 cm ×6.5 cm ?

Ans. Volume of cistern $= 150 \times 120 \times 110 = 1980000 \text{ cm}^3$

Volume of water $= 129600 \text{ cm}^3$

$\therefore$ Volume of cistern to be filled

$= 1980000 - 129600 = 1850400 \text{ cm}^3$

Volume of a brick $= 22.5 \times 7.5 \times 6.5$

$= 1096.875 \text{ cm}^3$

Let n bricks be needed.

Then, water absorbed by n bricks $=$

$$n \times \frac{1096.875}{17} \text{ cm}^3$$

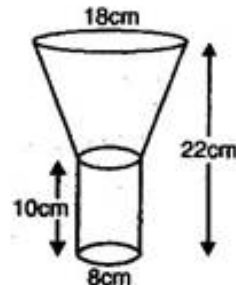$$\therefore \quad n = \frac{1850400 \times 17}{16 \times 1096.875} = 1792 \text{ (approx.)}$$

4. In one fortnight of a given month, there was a rainfall of 10 cm in a river valley. If the area of the valley is 97280 km^2, show that the total rainfall was approximately equivalent to the addition to the normal water of three rivers each 1072 km long, 75 m wide and 3 m deep.

Ans. Volume of rainfall $= 97280 \times \dfrac{10}{100 \times 1000}$

$= 9.728 \ km^3$

Volume of three rivers $= 3 \times 1072 \times \dfrac{75}{1000} \times \dfrac{3}{1000}$

$= 0.7236 \ km^3$

Hence, the two are not approximately equivalent.

5. An oil funnel made of tin sheet consists of a 10 cm long cylindrical portion attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm, find the area of the tin sheet required to make the funnel (see figure).

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